GAS

MAY 1961

The El Paso Story

A CHILTON PUBLICATION

THE NATION'S NATURAL GAS AUTHORITY

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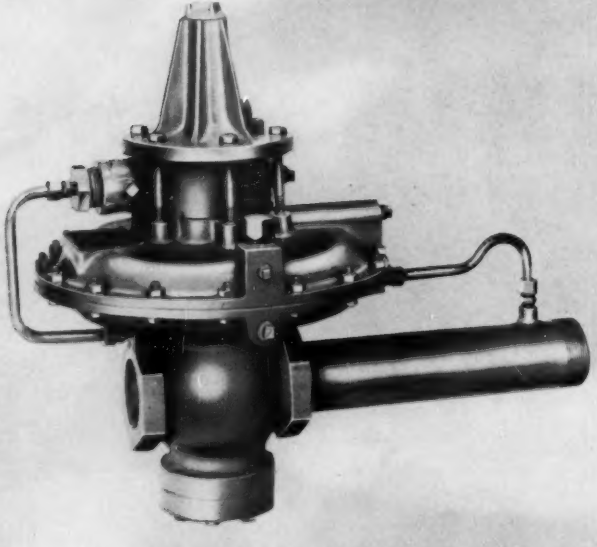

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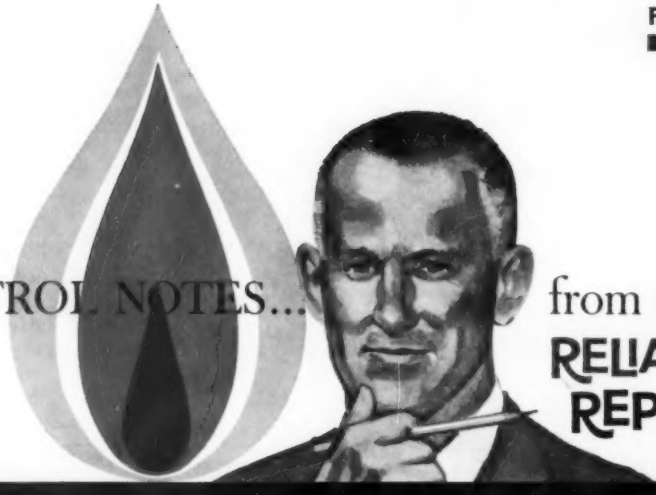

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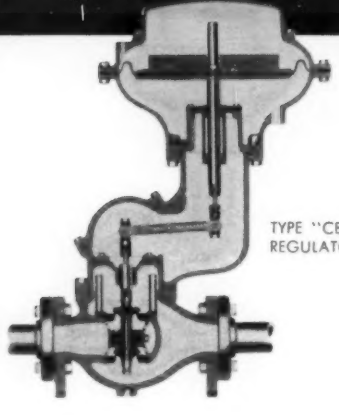

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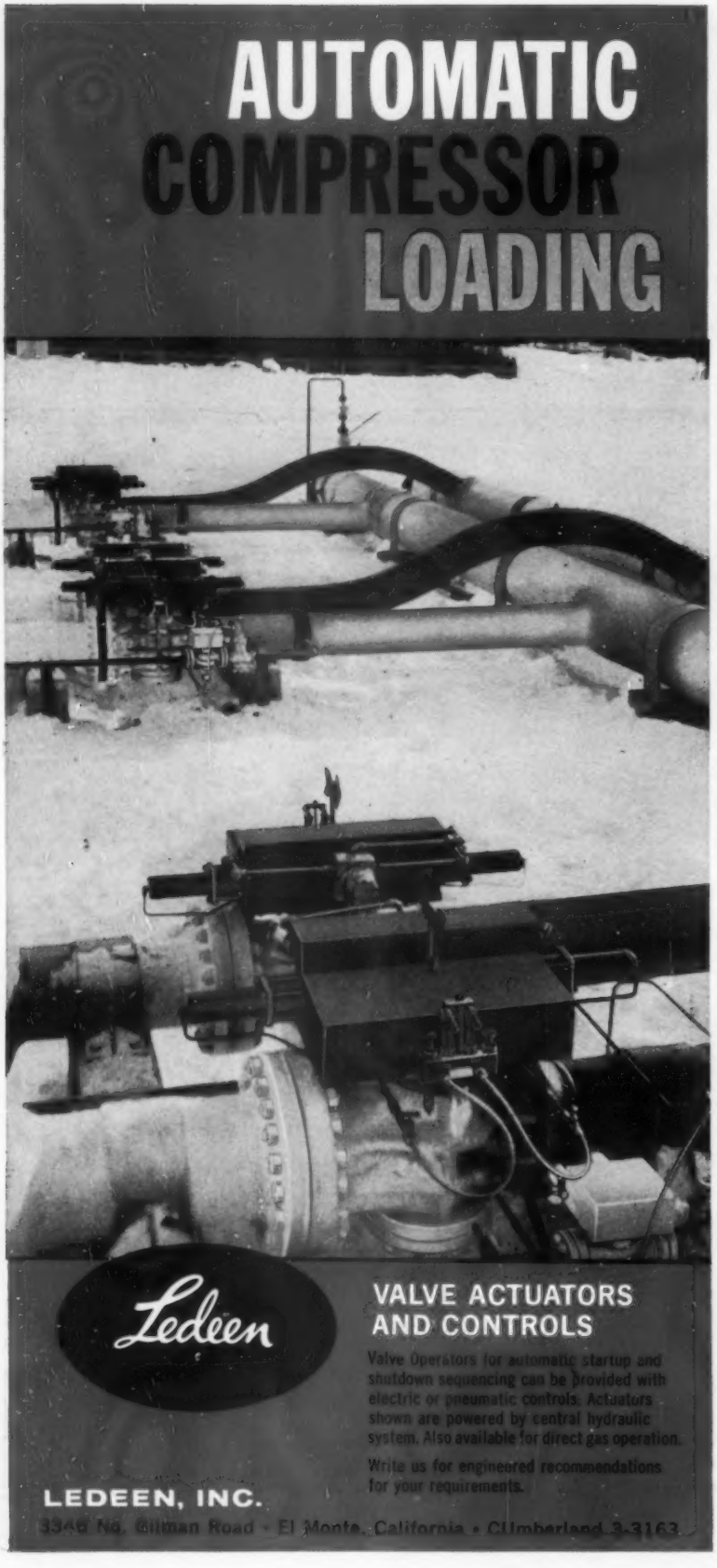
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Stanley Appleby, Comptroller

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CALENDAR

May

4-5..PCGA Transmission Conference —Biltmore Hotel, Santa Barbara, Calif.

8-12..AGA Operating Section, Distribution & Production Conference, —Sheraton Hotel, Philadelphia.

14-17..TIPRO Annual Meeting — Midland, Texas.

15-17..AGA MidWest Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago

17-19..Pennsylvania Gas Association Annual Meeting—Pocono Manor Inn., Pocono Manor, Pa.

25-26..AGA Operating Section, Transmission Conference—Brown Palace and Cosmopolitan Hotel, Denver.

25-26..PCGA Customer Service Conference—Jack Tar Hotel, San Francisco

25-26..Gas & Petroleum Association of Ontario Annual Meeting—London, Ont., Canada.

26-27..Florida Natural Gas Association —Americana Hotel, Bal Harbour, Fla.

June

5-6..AGA Eastern Regional Gas Sales Conference — Pittsburgh Hilton Hotel, Pittsburgh, Pa.

6-8..ISA Summer Instrument-Automation Conference & Exhibit—Royal York Hotel, Toronto, Ont., Canada.

6-8..6th Annual Appalachian Underground Corrosion Short Course —West Virginia University, Morgantown, W. Va.

13-14..National Safety Council's Public Utilities Section, Executive Committee—Laurentien Hotel, Montreal, Quebec, Canada.

13-16..3rd Biennial International Gas Chromatography Symposium — Kellogg Center, Michigan State University, East Lansing, Mich.

20..NEGA Operating Division — Worcester Polytechnic Institute, Worcester, Mass.

20-24..Canadian Gas Association Annual Meeting—Banff Springs, Alberta.

21-23..NEGA Measurement, Control & Corrosion School — Worcester Polytechnic Institute, Worcester, Mass.

26-27..Michigan Gas Association Annual Meeting—Grand Hotel, Mackinac Island, Mich.

28..8th International Gas Conference—Stockholm, Sweden.

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MAY 1961

Thermally Thinking

The implications of X-20

A MR. KEN B. HARPER, with Trancontinental Gas Pipe Line Corp., sent me a telegram last month. It appears friend Ken is a long unnoticed critic of the oriental art forms. His wired comment on the picture sufferers through this corner endured last month began: "Chinese Yul Brenner in hornrims disturbs tone," and so forth. It was a delightful wire, Ken; my associates are still rolling on the floor.

All of which simply brings to mind that we have not treated the Transco X-20 case herein. Transco X-20 is not a new shotgun shell an ammunition maker has brought to market. Rather, it is an important gas industry skirmish that may well become as familiar to gasmen in the future as the Memphis decision, Phillips decision, City of Detroit case, etc. The implications found in X-20 just might foretell a danger to all consumers of energy.

With that caveat, let's look at the thing. Consolidated Edison Co. of New York strayed from Manhattan in quest of some economical natural gas. It found such energy in the volume and at a price it wanted down in the Normanna and Sejita fields of Texas. Contracts were inked under which the utility was to purchase some millions cubic feet per day thereof from the gas producers.

Next, Houston-based Transco and Consolidated Edison came to terms on a proposition which had Transco handling the direct-purchase gas in its system. Transco would drop said gas at Consolidated Edison's front door up New York way. A transportation charge was to be paid Transco for this "X-20" service.

ConEd distributes electricity, gas, and steam—in addition to the superb philosophies and words of William T. Brady. Generators of part of its electricity are its Waterside and East River plants. These cute kilowatt creators appear to have fallen into ill repute due to a tendency to belch forth considerable emissions of gloop from their stacks. And, you never know how badly a good portion of the public is really feeling until they read in the newspapers that some industry is fouling the air.

Poor Waterside's opprobrium was particularly pronounced. Its fly-ash and sulfuric noxiousness seemed to be wafted by capricious winds to the nearby United Nations.

Hence, ConEdison proposed to lay down this relatively cheap X-20 service gas supply under boilers of its two somewhat maligned plants. Contracts with producers contained a prohibition on resale of the X-20 gas. Habitues of gas company maneuvering rooms normally style such a transaction a "direct" sale. And since it does not entail a sale for resale in interstate commerce, such a direct sale is assumed free from FPC jurisdiction. The transportation part of the lash-up is, of course, required to have FPC certification via Section 7 of the Natural Gas Act.

But, while Waterside and East River patiently awaited the ameliorant of natural gas, FPC declined to certificate the X-20 service. Further, the U. S. Supreme Court followed with the word that FPC did not abuse its discretion when it considered, among other things, END USE, preemption of pipeline facilities, and price in deciding the lack of public convenience and necessity for the X-20 case.

Supreme Court passed by the matter of smoke and/or smog as quickly as a dulcent young lady bypassed a squashed frog. Yet, our industry has only seen the beginning of cases in which natural gas supply will become embroiled with arguments supporting its use to cure the general public's problem with air pollution.

And federal regulators now have a signal from the nation's highest court that end use is in their jurisdiction. That is, FPC can consider end use in gas matters.

It would seem to be only a natural evolution from FPC controlling who will use gas and for what purpose, to controlling the same factors in the electric industry. And as other sources of energy come into the picture, through natural relationship with natural gas energy, who is to say that federal control of who can purchase what fuel for which purposes will not be upon the nation?

Transco's X-20 marks an important point. It gave federal regulators control of end use for natural gas under specific circumstances. We hope it will not evolve to all fuels and all types of consumers. The danger is, as history will support, when given a cupful, the federal government and its agencies tend to eventually wind up with a bucketful.

J. Fred Ehlen

EDITOR

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GAS HIGHLIGHTS

FPC takes lesson from ladies—changes its mind

After aging its March 3 order outlawing indefinite escalation for about one month, FPC decided a little escalation isn't too bad. Hence, on March 31, the commission modified its restriction to permit gas price renegotiation between gas producers and pipelines. Now, however, the frequency is limited to not more than once every five years.

"Cool" campaign clinched

The gas industry has mapped the biggest air conditioning sales campaign in its history for 1961, according to AGA. Its aim: to increase sales 70 per cent. Some 75 gas companies sent representatives to a series of meetings to lay groundwork for sales of at least 25,000 gas air conditioning units (in the 2 to 6.5 cooling-tons range) during 1961. Gasmen attending the sessions were told that the gas air conditioning market is practically untapped—a point that should not be too newsy to some of them.

"How do you bag off, Tovarich?"

Natural gas experts of Russia and the United States will soon exchange visits. The Soviets would look at our natural gas industry in May; the American group would tour Russia in July. AGA is assisting the State Department from this end.

Could it really be $255+ million?

Both houses of Congress have had bills introduced in this session to prevent interstate gas pipeline companies from piling one rate increase on top of another. Such legislation was sponsored by the California Public Utilities Commission and National Association of Railroad & Utilities Commissioners. Cal-PUC engineers estimate the total gas price increase (up to Dec. 31, '60) put into effect subject to refund is $255,264,000. Now, public service commissions in Iowa, Washington, Mississippi, Pennsylvania, Michigan and Alabama have rallied to support the matter.

New TV 'Special' Plans Listed

AGA announced in mid-April the gas industry's exclusive sponsorship of a series of one-hour, live TV dramatizations of famous motion pictures. The series, which includes *Rebecca, Spellbound, Notorious,* premieres Oct. 4 at 10 PM. Thereafter, the shows will be on each Sunday at 10 PM. Top name stars will be featured. Some shows will be in color.

National Gas Code Sought

Big point of conversation at AGA Research & Utilization conference in Cleveland (April 4-6) was that the association and other interested parties (gas utilities throughout the country) are trying to establish a National Gas Code, for which Z21.30 and NFPA's Pamphlet #54 would form the basis. One sticky point such a code would try to clarify is where a property line is drawn.

Plastics Pipe System in N. C.

No. Carolina Natural Gas Corp. is installing new distribution system in Goldsboro area. Of news here is that entire system is 1¼-in. high density polyethelene Marlex pipe. The system will serve 250 tobacco-curing barns in that eastern N. C. area.

Court nays trustbuster's try

The Federal Power Commission was correct, and El Paso Natural Gas Co. can too retain its merger of Pacific Northwest Pipeline Corp. Thus, said a U. S. Court of Appeals while rejecting Justice Department objections to the FPC approval. Leading lawyers in the gas industry's legal-lodge speculate that the matter can develop into a Supreme Court test to locate the boundary between government regulators (FPC) and government trustbusters (Justice Department).

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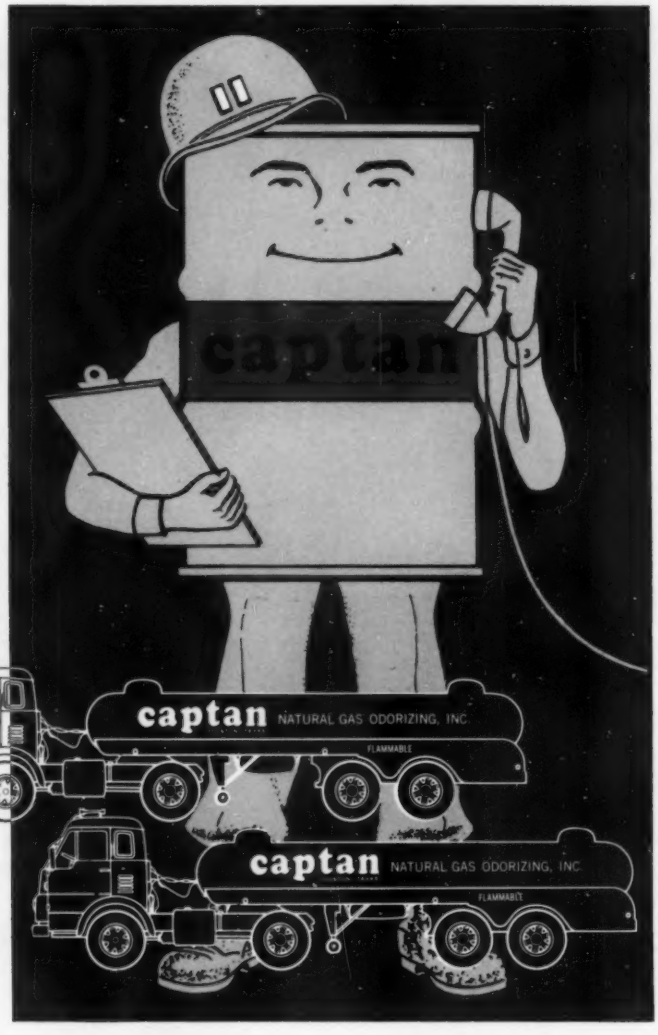

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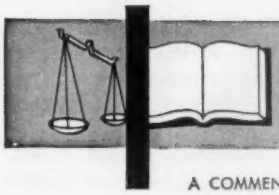

Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

"Natural resources"—including gas

THE President of the United States gave a stimulating message to Congress about our natural resources. Natural gas is one of our exhaustible resources, but as citizens with progeny we are interested in all of the other natural resources too. Here is an appraisal of this vital subject in the Chief Executive's words in a message to Congress:

"From the beginning of civilization, every nation's basic wealth and progress has stemmed in large measure from its natural resources. This nation has been, and is now, especially fortunate in the blessings we have inherited. Our entire society rests upon—and is dependent upon—our water, our land, our forests, and our minerals. How we use these resources influences our health, security, economy, and well-being.

"But if we fail to chart a proper course of conservation and development—if we fail to use these blessings prudently — we will be in trouble within a short time. In the resource field, predictions of future use have been consistently understated. But even under conservative projections, we face a future of critical shortages and handicaps. By the year 2000, a U. S. population of 300 million—nearly doubled in 40 years—will need far greater supplies of farm products, timber, water, minerals, fuels, energy, and opportunities for outdoor recreation. Present projections tell us that our water use will double in the next 20 years; that we are harvesting our supply of high-grade timber more rapidly than the development of new growth; that too much of our fertile topsoil is being washed away; that our minerals are being exhausted at increasing rates; and that the nation's remaining undeveloped areas of great natural beauty are being rapidly pre-empted for other uses.

"Wise investment in a resource program today will return vast dividends tomorrow, and failures to act now may be opportunities lost forever. Our country has been generous with us in this regard—and we cannot now ignore her needs for future development.

"This is not a matter of concern for only one section of the country. All those who fish and hunt, who build industrial centers, who need electricity to light their homes and lighten their burdens, who require water for home, industrial, and recreational purposes — in short, every citizen in every State of the Union—all have a stake in a sound resources program under the progressive principles of national leadership first forged by Pinchot and Theodore Roosevelt, and backed by the essential cooperation of state and local governments."

• Natural gas

Estimates of natural gas reserves in the United States are compiled by the American Gas Association. The association estimated that the proved recoverable natural gas reserves in the United States were 262.6 trillion cu ft as of Dec. 31, 1959. This compares with 254.1 trillion cu ft a year earlier. The reserve life index for the whole country is estimated at 21.1 years based on production in 1959, compared with 22.1 years based on estimated reserves at the end of 1958 and production during 1958.

The natural gas companies reporting to the FPC added approximately $1100 million to their investment in gas plant in 1959, while revenues received from overall gas operations increased $480 million. The companies' total gas utility plant investment amounted to $11,032 million at the end of 1959, and revenues received during the year aggregated $4054 million.

The natural resource of gas is important to the whole nation with about 130 million people using it. Intelligent utilization of natural gas, plus incentives to discover and develop additional reserves are paramount to future generations.

• Water resources

Our nation has a bountiful supply of water; but it is not a blessing we can regard with complacency. We now use 300 billion gal. of water a day, much of it wastefully. By 1980 we will need 600 billion gal. a day.

Our supply of water is not always consistent with our needs. Floods one day in one section may be countered in other days or in other sections by the severe water shortages which are now afflicting many eastern urban areas and are particularly critical in the West.

The President said: "Our available water supply must be used to give maximum benefits for all purposes—hydroelectric power, irrigation and reclamation, navigation, recreation, health, home and industry. If all areas of the country are to enjoy a balanced growth, our Federal reclamation and other water resource programs will have to give increased attention to municipal and industrial water and power supplies as well as irrigation and land redemption" * * *

"This administration accepts the goal urged by the Senate select committee to develop comprehensive river basin plans by 1970, in cooperation with the individual states. I urge the Congress to authorize the establishment of planning commissions for all major river basins where adequate coordinated plans are not already in existence. These commissions, on which will be represented the interested agencies at all levels of government, will be

charged with the responsibility of preparing comprehensive basic development plans over the next several years."

Pollution of our rivers and streams has—as a result of our rapid population and industrial growth and change—reached alarming proportions. To meet all needs —domestic, agricultural, industrial, recreational—we shall have to use and reuse the same water, maintaining quality as well as quantity.

Current corrective efforts are not adequate according to the President. This year a national total of $350 million will be spent from all sources on municipal waste treatment works. But $600 million of construction is required annually to keep pace with the growing rate of pollution. Industry is lagging far behind in its treatment of wastes.

"No water resources program is of greater long-range importance—for relief not only of our shortages, but for arid nations the world over —than our efforts to find an effective and economical way to convert water from the world's greatest, cheapest natural resources — our oceans—into water fit for consumption in the home and by industry. Such a breakthrough would end bitter struggles between neighbors, states, and nations—and bring new hope for millions who live out their lives in dire shortage of usable water and all its physical and economical blessing, though living on the edge of a great body of water throughout that parched lifetime," asserted the President.

Congress was urged to extend the current saline water conversion research program, and to increase the funds for its continuation to a level commensurate with the effort current studies show to be needed—now estimated to be at least twice the level previously requested.

• Electric power

Mr. Kennedy said "To keep pace with the growth of our economy and national defense requirements, expansion of this nation's power facilities will require intensive effort by all segments of our power industry. Through 1980, according to present estimates of the Federal Power Commission, total installed capacity should triple if we are to meet our nation's need for essential economic growth. Sustained heavy expansion by all power suppliers—public, cooperative, and private—is clearly needed.

"The role of the Federal Government in supplying an important segment of this power is now long established and must continue. We will meet our responsibilities in this field.

"Hydroelectric sites remaining in this country will be utilized and hydroelectric power will be incorporated in all multiple-purpose river projects where optimum economic use of the water justifies such action.

"The Tennessee Valley Authority will continue to use the financing authority granted it by the last Congress to meet the power needs of the area it serves.

"Our efforts to achieve economically competitive nuclear power before the end of this decade in areas where fossil fuel costs are high will be encouraged through basic research engineering developments, and construction of various prototype and full-scale reactors by the Atomic Energy Commission in cooperation with industry.

"In marketing Federal power, this administration will be guided be the following basic principles which recognize the prior rights of the general public, consumer and taxpayer who have financed the development of these great national assets originally vested in them:

"(1) Preference in power sales shall be given public agencies and cooperatives.

"(2) Domestic and rural consumers shall have priority over other consumers in the disposal of power.

"(3) Power shall be sold at the lowest possible rates consistent with sound business principles.

"(4) Power disposal shall be such as to encourage widespread use and to prevent monopolization.

"Finally, I have directed the Secretary of the Interior to develop plans for the early interconnection of areas served by that Department's marketing agencies with adequate common carrier transmission lines; to plan for further national cooperative pooling of electric power, both public and private; and to enlarge such pooling as now exists."

One aspect of the new administration that is disturbing to those advocating private enterprise for utility services, is the large number of Presidential appointees who favor public ownership of electric power.

Our forest lands present a challenge to our foresight. Trees planted today will not reach the minimum sizes needed for lumber until the year 2000. Most projections of future timber requirements predict a doubling of current consumption within 40 years. At present cutting rates, we are using up our old growth timber in western stands. We must move now to meet future needs, and improve the productivity of our nearly 500 million acres of commercial forest land.

The condition of our forest land area is substantially below par: 45 million acres are in need of reforestation; more than 150 million acres require thinnings, release cuttings, and other timber stand improvement measures if growth rates are to be increased and quality timber produced; forest protection must be extended to areas now poorly protected. Losses in growth from insects and disease need to be reduced substantially by wider application of known detection and control measures.

The President declared: "I urge the Congress to accelerate forest development on Federal public lands both as a long-term investment measure and as an immediate method of relieving unemployment in distressed areas."

The Federal Government owns 770 million acres of public land, much of it devoted to a variety of essential uses. But equally important are the vacant, unappropriated, and unreserved public lands, amounting to some 477 million acres — a vital national reserve that should be devoted to productive use now and maintained for future generations.

Much of this public domain suffers from uncontrolled use and a lack of proper management. More than 100 million acres of our Federal grazing districts are producing livestock forage well below their potential. The President said: "We can no longer afford to sit by while our public domain assets so deteriorate.

"I am, therefore, directing the Secretary of the Interior to—

Continued on page 171

More *profit*-ability from Robertshaw

The satisfied customer keeps your gas ranges sold!

Excessive service calls, returned merchandise and dissatisfied customers are the shortest route to lost profits. The direct route to greater profit-*ability* is to *keep the sale you've made!*

Your customer will stay sold only if the range she bought really does all the things you said it would . . . just like Robertshaw's FLAME MASTER and FLAME SET controls mean gas ranges do more than cook!

- "*burner-with-a-brain*" features . . . food won't burn . . . pots won't scorch
- low temperature oven features . . . warm plates at temperatures that "pamper" the finest china . . . safely hold cooked food for hours . . . quick-thaw frozen foods

. . . and the dependability that is built into every Robertshaw control means less service calls for you.

To keep your gas ranges sold, specify Robertshaw FLAME MASTER and FLAME SET controls and get greater profit-*ability* . . . Robertshaw Thermostat Division, Robertshaw-Fulton Controls Company, Youngwood, Pennsylvania. VMA 7654

Robertshaw

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. . . the name that MEANS temperature control

15" HANDLE

CAP

Why drill services?
PUNCH 'em!

This product covered by Patent No. 2,950,637 —other patents pending

Four small guides which hold punch to its true axis.

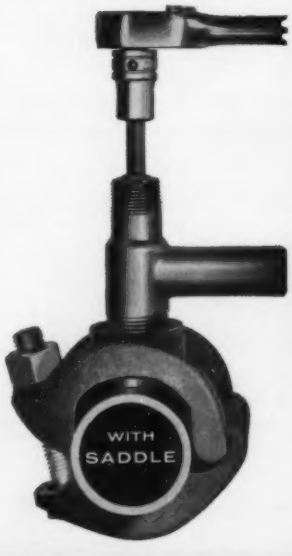
For taking services off mains. A quick, safe, steel (shell casting) welding tee that incorporates in each tee a punch and positive shut-off. Does away entirely with drill devices. We also have a model threaded at the base to screw into the saddle.

Punches. ¼", 5/16" and ⅜" diameter, recommended for 5/16" (or thinner) pipe wall thickness. ½" diameter, restricted to use on ¼" wall thickness or thinner.

Each tee is tested to 5,000 p.s.i. hydraulic pressure, and carries "Rated 1,000 pounds". A 5 to 1 safety factor. Made from steel similar to pipe, it welds easily, and in the saddle model, takes a perfect thread.

Both sizes made have 1" base. Side outlet can be furnished ¾" or 1", end beveled for welding, standard pipe size, either threaded, or smooth for compression coupling. Or outlet can be internally threaded for ½" pipe size.

With this tee you will be forever free from the cost of drilling machines, broken drills and drill machine maintenance and repairs. We feel this tee is the finest service improvement ever offered to the gas industry. Write for circular with installation instructions.



M. B. SKINNER CO.
SOUTH BEND 21, INDIANA

SKINNER-SEAL PUNCH-IT TEE

TECHNICAL TRENDS

By GUY CORFIELD
Professional Engineer,
Los Angeles

Plasma spray heat resistant coatings

Ability to produce materials or coatings that will resist high temperatures is of extreme importance in the missile and space vehicle field. It is also of great interest to the gas industry due to increasing possibilities in gas-fueled turbines which operate at high combustion and power chamber temperatures. Also the thermionic and magneto-hydrodynamic devices — and particularly the latter — which are emerging as fuel-fired converters of heat direct into electricity, are dependent on high heat resistant materials for practical development.

A process which appears to offer a solution to at least some of these high temperature problems is the plasma spray method of applying refractory materials to a variety of base surfaces. A plasma in this application is a gas that has been passed through a high-energy electric arc which breaks down some atoms into smaller particles. When these particles recombine, intense heat is developed so that, in effect, the gas is heated to thousands of degrees F. It is possible to heat and spray, in a molten form, various high melting point materials, by injecting them as powder into this ultra high-temperature gas stream.

The gases used are hydrogen, nitrogen, helium and argon. The resulting plasma temperatures can range from 6000 deg F using hydrogen, to 30,000 deg F using argon. Powders include the very high melting point metals and the various oxides, carbides, nitrides, silicides, borides, ceramics, etc. Used mostly for high temperature protection, coatings are also applied to produce strength, wear and chemical resistance, heat insulation, and even catalytic effects. Surfaces to which the coatings can be applied include metals, ceramics, glass, graphite, reinforced plastics, etc. It is even claimed that wood and paper can be sprayed because the heat dissipates rapidly after the plasma jet leaves the "gun."

Several factors must be considered in selection of equipment and technique. Gas to produce the plasma jet must be capable of developing the necessary temperature to melt the powder. It must not, however, react unfavorably with the powder or with the surface to be sprayed. Hydrogen, and even nitrogen, are chemically active at these high temperatures. Helium and argon are inert. The best powder to do the job must be selected, but the powder must be compatible with the surface to be coated. Finally the necessary bond must be produced, which may be mechanical interlocking, metal alloying or chemical combination.

While this is obviously a highly technical process and operation; apparatus, materials and instructions have been developed so that an operator, usually with welding experience, needs relatively little additional training. Several types of apparatus and a great variety of powders are available. Some 250 units costing about $10,000 each are said to be now in use in the United States.

Propane hydrate method for desalting water

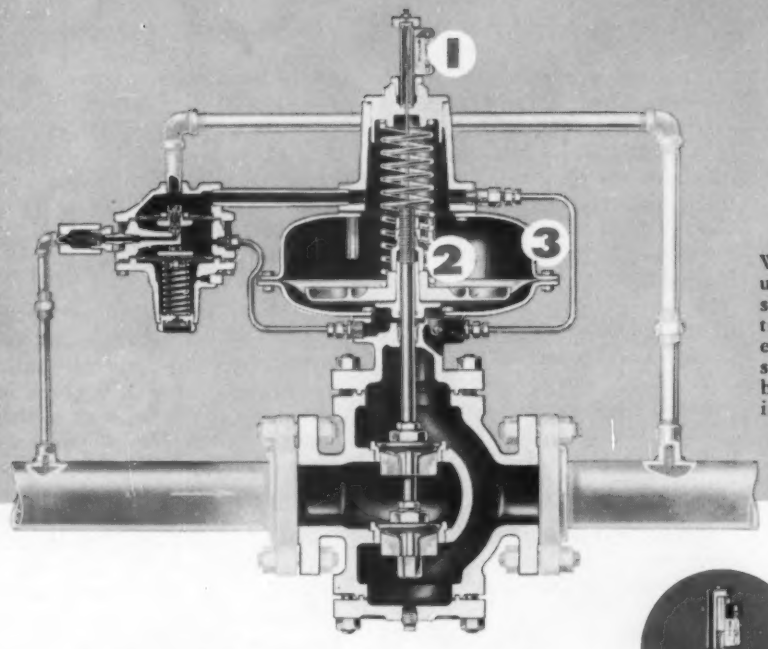
A process from Koppers Co., for desalting sea water by intermediate formation of propane hydrate, reminds one of the old adage: "What's one man's meat is another man's poison." Hydrocarbon hydrates are an annoying problem to gas transmission and distribution engineers. These hydrates are chemical compounds of the several natural gas hydrocarbons (methane, ethane, propane, butane) with water. The hydrocarbon molecule combines with seven or eight or more molecules of water. This forms a solid crystalline mass containing 85 per cent or more water, by weight, and looking very much like "ice" which is the usual terminology in gas engineering and operating circles. This ice forms at temperatures above the freezing point of water—30 deg. F or more above when pressures are high and sufficient water vapor is present—and therefore can plug pipelines, particularly at the outlet of regulators where gas has been cooled by expansion. Preventive measures in gas operations are dehydration of gas, injection of retardants such as methyl alcohol, localized external or internal heating, avoidance of extreme pressure reduction in one step, etc.

Koppers has taken advantage of this hydrate phenomenon to develop its process for desalting sea water. It is based on the fact that water going into the hydrocarbon-water crystal is salt-free or "fresh." Propane hydrate was selected because it offered convenient temperature-pressure operating conditions. It will form at 35 deg. F @ 57 psig, up to 60 deg. F @ 92 psig. In the proposed operation, hydrate will be formed at approximately the lower set of conditions. Crystals will then be filtered, washed, and then decomposed at approximately 45 deg. F. The fresh water can be readily separated from the propane as the two liquids are immiscible. Propane not only functions as a means for forming the hydrate molecule and trapping fresh water, but also as a heat transfer medium. In the reactor, it vaporizes to remove the heat of formation of the crystals. In the melting chamber, it is compressed and condensed on the crystals to provide heat of decomposition.

It is stated that because hydrate crystals form above the freezing point of water, the process requires less energy than either normal freezing or distillation. The U. S. Office of Saline Water Conversion is interested in it as an addition to the various means now under development (see Technical Trends, April, 1961, under the title "Saline Water Conversion").

Important information about an

ULTRA SENSITIVE GAS REGULATOR



FISHER TYPE 298T

APPLICATIONS

While the Type 298T is most widely used as an intermediate or low pressure district regulator on gas distribution systems, it is equally effective in industrial applications such as heat treating furnaces, bakeries, boiler plants, and other installations.

SIZES AND PRESSURE RANGES

VALVES BODIES

- Double port "A" Body with metal to metal seats. Sizes—1" to 12"
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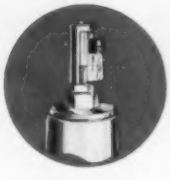
LOADING PILOTS

- Type 61H low pressure pilot Downstream pressure ranges—5" w.c. to 2 psi—2 to 10 psi—10 to 20 psi
- TYPE 61H High pressure pilot Downstream pressure ranges—10 to 65 psi
- TYPE 61HH Extra high pressure pilot Downstream pressure range—35 to 100 psi

MAXIMUM INLET PRESSURE

Valve Sizes 1 through 4"—up to 250 psi—6"—up to 200 psi—8"—up to 100 psi

FEATURES



1 Travel indicator shows valve position. No stuffing box—no friction causing seal! Enclosed in glass. Supplied as standard with no extra charge.

2 Specially constructed tapered locknut on rugged stem connection—no inner valve spinning under high gas flows.

3 Steel diaphragm casings of modern design for additional safety and adequate stroke for valves of all sizes.

If you want additional information about the FISHER Type 298T, write for Bulletin P-298C.

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FISHER® Controls

SINCE 1880

WASHINGTON

BY NEIL REGEIMBAL

GAS Washington Bureau
1093 National Press Bldg.
Washington 4, D. C.

The honeymoon is over

As every husband knows, all honeymoons come to an end sooner or later. From then on, life is a mixture of work, fights, and romance too. President Kennedy's idyll with Congress lasted only a few months. For all practical purposes, he's settled down to a normal pattern of alternate periods of fighting and wooing.

Now, the new chief executive is in a fighting mood. After suffering his first defeats—strangely enough, by narrow margins reminiscent of his slim victory at the polls—the President is out to battle his way to some victories.

He is, as politicians say, "turning the screws" on his recalcitrant Democratic majority, mostly the Southern members of his party in the legislative halls. Patronage, public works, similar levers are being used.

The gas industry, as all business, will feel the sting of this developing White House-Congress relationship.

Bedrock of the Kennedy administration "New Frontiers" program is a government designed to help the "little fellow"—the consumer, the individual taxpayer, the small businessman, the farmer, and all other segments which in a political dictionary make up this "little man."

Defeats in some early phases of this program, most of them only partial, has strengthened the determination of the administration to build its record for the 1964 elections by a series of moves to create a firm image of government for the little guy.

If there was any doubt, this determination kills off any chance for a gas industry-sponsored gas bill. It strengthens the chance of some cut, perhaps next year, in gas and oil depletion allowances. It strengthened the case for reorganization of Federal Power Commission. It also boosts the already strong probability that congressional fuels policy studies to get underway this year will produce restrictions on end use of gas and new methods of promoting the competitive strength of coal.

The gas industry, along with almost all industries, will be under the gun of the Kennedy help-the-consumer drive in many ways, both direct and indirect.

His creation of a new consumer watchdog unit in the White House is a good example. Congress has for years balked at passing a measure to create an often-proposed "Department of Consumers" in government. President Kennedy now has simply taken the bit in his mouth and set up a special "advisory unit" to accomplish much the same ends.

He has called in a professional consumer counsel to head the new unit, Persia Campbell. An economics professor at Queensboro Community College in New York, she headed a similar office for Averill Harriman when he was governor of New York.

Her job is to head a fairly elaborate staff of experts to "speak for consumers" before regulatory agencies, such as FPC and congressional committees; and to set up similar sub-groups in other government departments — Agriculture, Labor, Commerce, and the rest.

While on the surface, such a post is merely an advisory group, discussion over the years of such proposals makes it clear that the main purpose is to put heat on various bodies to in turn put heat on business to work on slimmer profits, pay higher wages, and generally match what will become an "approved" consumer viewpoint.

This has often been related to indirect price and wage controls by its opponents, and has even brought cries from many manufacturers that it will lead in time to quality stabilization, when the consumer spokesmen get around to rating quality in various products or in classes of goods.

On another front, the Kennedy administration, through the President's brother Robert Kennedy, who is now Attorney General and chief personnel director for the New Frontier, is building a huge antitrust steamroller.

The Attorney General is setting up a much-strengthened antitrust campaign, coordinated between his Justice Department and the Federal Trade Commission, with "branches" formed in each of the other agencies (FPC included) and departments of government.

Alleged price-fixing, bid-rigging, collusive activities of any sort, and other activities are being explored. The staffs of these two antitrust agencies will be vastly expanded in the next year or two.

This interest in the end result of industry, prices and services to consumers, strengthens probability of a major overhaul of FPC.

Here are some recent developments:

- Rep. Oren Harris, Chairman of

Continued on next page

the House Commerce Committee, has created a permanent subcommittee to keep an eye on the regulatory agencies. It succeeds the special "Oversight" subcommittee which in the past probed these agencies, including the dealings between Midwestern Gas Transmission Co. and Thomas Corcoran and FPC. Rep. Harris will head this committee.

• Rep. Harris also has introduced legislation to set up strict "rules of conduct" for these agencies and people and industries dealing with them. He has also introduced a bill to expand the five-member FPC to seven members to help speed up its activities and to make it clear the chairman serves at the pleasure of the President in office, rather than the President who appoints him. This arose because Chairman Jerome Kuykendall, an Eisenhower appointee, has not been willing to step down for a Kennedy appointment.

• James M. Landis, the off-and-on White House director of the campaign to alter the regulatory agency set-up, is making it clear that the administration will aim particularly at FPC in any reorganization drive. A drive to exempt small producers (probably under $1 million in income a year) is a definite probability.

Meanwhile, FPC has been responding to the weight of criticism of the past few years.

After some years of skirting fringes of the question, the commission now has outlawed all indefinite escalation clauses. These clauses permit all producers selling to a pipeline to raise their rates when the pipeline pays a higher rate to one producer. They have brought temporary rate increases to pipelines involved, which in many cases have been upheld.

At the same time, FPC's proposed "area pricing system" is drawing fire from the gas industry and from the industry's critics as well. There are indications, still weak, that this proposal will not become a final FPC policy, particularly if President Kennedy wins his fight to name a new FPC chairman.

Lobbying deductions

A NEW campaign is underway in Congress to restore income tax deductions for legitimate lobbying expenses.

Business, labor unions, farm groups, and all spokesmen for organizations which conduct lobbying activities, are affected. This includes, among others, the American Gas Association.

Legislation is being sponsored by Rep. Hale Boggs (D., La.) to reverse an Internal Revenue Service regulation adopted several years ago, based on a U. S. Supreme Court decision. This regulation in effect bars tax deductions for contributions to any group which engages "extensively" in lobbying or "propaganda" activities. This would include a group which spends even 35 per cent of its income for "educational" activities. In this case, a member could take a tax deduction only for 65 per cent of his contribution.

Rep. Boggs says the present regulation is an indirect bar to freedom of speech. "This (regulation) is based on an alleged—but nonexistent—precedent decreed by the Supreme Court," the lawmaker contends.

"It is what I call 'censorship by taxation'—it is punitive taxation—which places a roadblock against any business or industry . . . who wishes to express views on the passage or defeat of legislation," Rep. Boggs insists.

He also is highly critical of the mechanics of the tax agency's regulation, which permits each internal revenue district to interpret what is unjustifiable lobbying expenditures.

The Boggs bill would apply to all lobbying—state, federal, municipal.

It affects union dues as well as trade association dues.

Highways in trouble

ONE undercurrent of the battle over how to best finance the federal highway building program is a drive by truckers and "highway users" to forbid states to pay all or part of costs of utility relocation.

The highway program is in trouble. At present land and construction cost levels, income from special taxes which are supposed to pay for the $41 billion program will fall short. The federal government is supposed to put up about $37 billion of the total, but will collect about $9 billion less than this by 1972, when the program is due to be completed. The answer — new taxes, less spending, or a later completion.

President Kennedy has proposed higher taxes on highway users, particularly heavy trucks, and on the materials all vehicles use, such as tires, tubes, tread rubber, diesel oil, and similar products. Truckers are naturally fighting the proposal bitterly.

An alternative is another ½-cent boost in the gasoline tax, to 4½ cents, which all vehicles would pay.

At the same time, there are complaints that money spent to date has not been wisely used. Closing spending "loopholes" such as the payment in many states of utility relocation will make up most of the shortage in the future, highway users say.

Utility reimbursement is still being debated in many states.

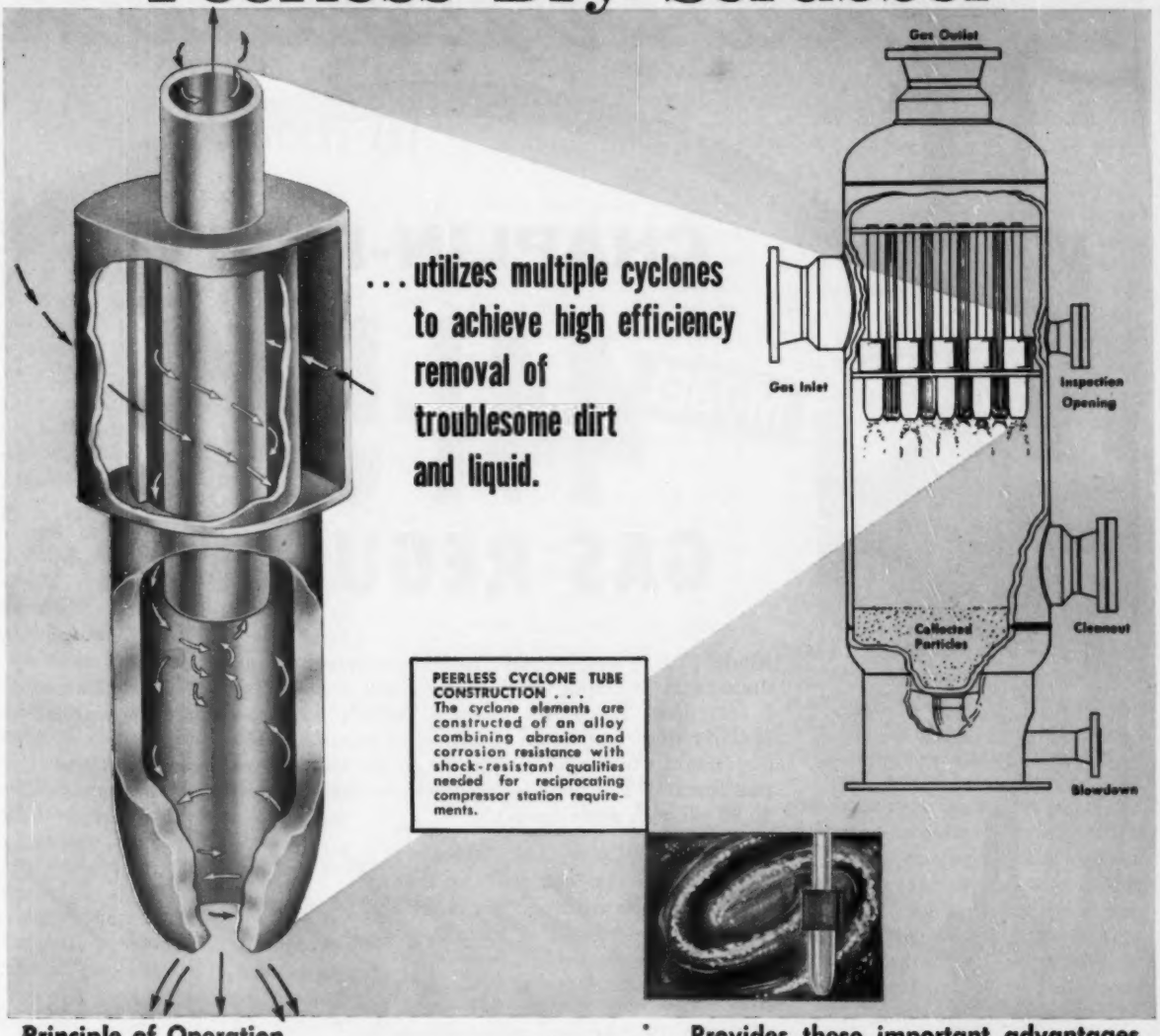
Early this year, legislatures in Georgia, Indiana, and Pennsylvania were considering proposals to reimburse utilities for the costs of relocating lines. At the same time, a proposal in Massachusetts would repeal that state's reimbursement law.

Georgia proposed to pay all or part of the costs of relocating water and sewer lines owned by municipalities and other governmental units. Indiana would repay all utilities for costs involving only the interstate system, while Pennsylvania would repay relocation costs for all new roads built in part with federal funds.

In other states, Montana is considering prohibiting any reimbursement except where the utility owns the land, and Oklahoma is considering giving the Highway Commission the right to ban telephone or telegraph lines along new highways except in urban areas. ■

Another in a complete line of Peerless Scrubbers

Peerless Dry Scrubber



. . . utilizes multiple cyclones to achieve high efficiency removal of troublesome dirt and liquid.

PEERLESS CYCLONE TUBE CONSTRUCTION . . . The cyclone elements are constructed of an alloy combining abrasion and corrosion resistance with shock-resistant qualities needed for reciprocating compressor station requirements.

Principle of Operation

The Peerless Dry Scrubber consists of small diameter cyclones in parallel to provide the centrifugal force necessary for efficient small particle removal at high pressures. Peerless Dry Scrubbers are offered in a complete range of sizes and working pressures to fit any scrubber requirements. Also available are compartmented scrubbers to handle the problems of widely varying flows with only one vessel where multiple scrubbers have been required heretofore. Write for descriptive literature.

Provides these important advantages

1. Efficient removal of dust and liquids.
2. Cannot be overloaded.
3. Uses no scrubbing oil, hence no oil loss.
4. Requires no oil filling or settling tanks.
5. Virtually maintenance free, requiring only occasional blowdown of collected material.
6. Ordinarily smaller and less costly than wet type scrubbers.

Engineering Assistance Available: Peerless makes all types of Scrubbers, including Dry Scrubbers, Oil Bath, both a fixed contactor type (Swirl-Gas Cleaner) and a revolving contactor type (Scrubosphere). In addition, Peerless makes Gas Filters. Ask us for recommendations on the type Scrubber best suited to your application.

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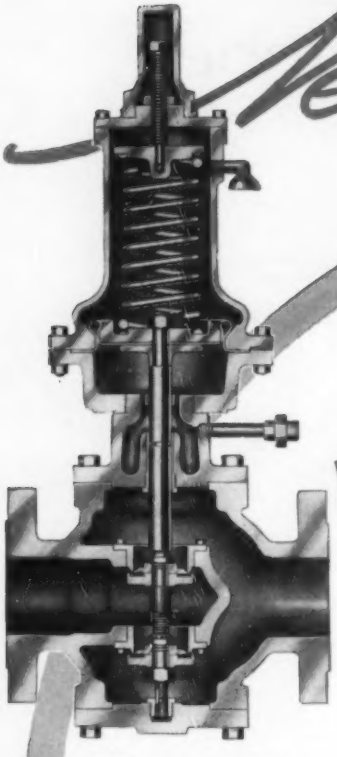
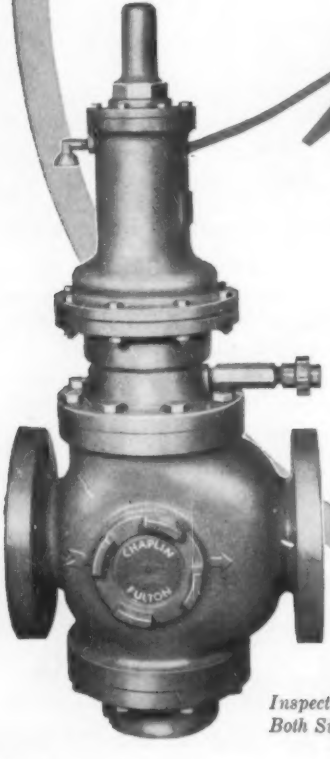
MODEL 441-57S GAS REGULATOR



SIZE: 2"—3"—4"—6"
125 lb. iron—W. P. 175 psi
250 lb. ductile—W. P. 400 psi
Series 30 steel—W. P. 720 psi

Model 57-S, a simple spring loaded regulator, operates on a new diaphragm principle which will control accurately until the regulator is wide open. The outlet pressure "fall-off," typical of spring regulators, is eliminated—not by an uncontrolled velocity effect—but by a diaphragm which changes its size as the valve moves to give straight line control. For pounds-to-pounds service,—controlled pressures to 75 psi with same assembly.

New in design!



Inspection Plates Both Sides.

Also, a new body design—441—with gas exit areas greatly enlarged to prevent turbulence and increase capacity.
And to help in your visual inspection program—side inspection plates on *both* sides of the body have been included. Screwed-on with O-ring seal, they can be quickly removed and replaced—no gasket problem. Standard face-to-face dimensions now make the 441 interchangeable with other regulators.

ACCURATE CP MFG CO DEPENDABLE

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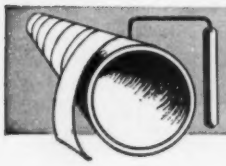

CORROSION PREVENTION

DISTRIBUTION
TRANSMISSION

Watch it!

By MARSHALL E. PARKER
Consulting Engineer, Houston

A WELL-DESIGNED cathodic protection system is ostensibly capable of operation for long periods of time without supervision. It is unwise, however, to depend on one to do so, because it is subject to failure from a variety of causes. This can take the form of a complete cessation of operation, due to the actual failure of one or more components; it may be an equally complete, but temporary, cessation of operation, due to the operation of an overload protective device, or to other power failure. Or it may be a failure to furnish full protection, while still operating at what was originally a satisfactory level, due to an increase in the current demand of the protected structure. This, in turn, may be caused by gradual deterioration of coating, or it may be due to the accidental connection of a parasitic load to the line under protection—an event which can occur miles away from any recognized component of the protective system.

All of these occurrences have one factor in common—total or partial loss of protection. Unfortunately, they also have in common the characteristic that they will ring no bell, flash no light, give no signal at all that they have occurred. Almost any other device in use today will make its failure known in short order; but a cathodic protection system can fail completely, and this will not be known for weeks, or months, or even years—it may not be known until a disastrous pipe failure occurs, by which time an enormous amount of damage will have occurred.

The only remedy for this state of affairs is vigilance—the system must be watched, and watched closely. What shall we watch? How often shall we check each component? There are three things to consider in making these decisions. First, we shall want to check those things which are most likely to fail. Then we shall want to check some things which are relatively easy to check, even if the information yielded is meager. And, finally, we shall want to check those points which will afford the most information. By a suitable choice of this last kind of check, it is possible to obtain very close supervision with little effort.

In a rectifier system, the rectifiers themselves should be the objects of frequent inspection. (See "Routine rectifier inspections" in the January 1960 issue.) In between these more elaborate inspections, carried out by technical personnel, there should be readings of the rectifier meters at more frequent intervals. These can be carried out by field personnel, since they require little experience and no special equipment. To be of any value, they should be reported promptly, and *they should be studied.* This may merely take the form of plotting them as a function of time, but if the plot is made and not studied, no benefit will be derived. It is also important that the follow-up to any unusual reading should be prompt, and should include a word to the reporting employee, so that he can see that his work is being utilized.

In the third category mentioned, the points which will yield the most information, we must naturally select points as close to the end of the process as possible—where feedback of information is of maximum value. This means checking, at a selected set of points, the actual achieved pipe-to-soil potential of the protected structure. If the line in question is a long transmission line, protected by a set of widely spaced rectifiers, then the points to be checked are those lying at or near the electrical midpoints of the sections between rectifiers. If all of these points are found to be up to protection, then we can be reasonably sure that the line as a whole is protected. If one or more of these is found to be below protection, then further investigation will usually be required to determine the cause and the indicated remedy.

The instrumentation to be used should be such that technical personnel will not be required to make the readings. It does not require a great deal of instruction to teach field personnel to use a simple copper/copper sulfate electrode and a high-resistance voltmeter; there is available a dual-sensitivity meter which makes the correction for high contact resistance all but automatic. However, even with an instrument in every division, there will be many opportunities to take readings which will be lost because the meter is not at hand. To meet these objections it is possible to install at the critical points permanent indicating pipe-to-soil voltmeters. Each such installation consists of a high- or medium-resistance voltmeter, housed in a weatherproof enclosure, and connected between the line and a buried zinc reference electrode. A special dial and a bridge circuit make it possible to calibrate the instrument so as to read the equivalent of potentials with respect to a standard copper/copper sulphate electrode. A reading may be had by merely pushing a button.

These readings should be taken at regular, scheduled intervals, two weeks to a month, and each reading should be transmitted, by post card or company communications, to the corrosion office. There the readings should be posted and charted. Seasonal variations will be observed, corresponding to fluctuations in soil moisture; a slow decline may be

Continued on page 116

THERE'S NOTHING LIKE A CLEVELAND J-20 FOR DISTRIBUTION AND SERVICE TRENCHING

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OFF TO THE NEXT JOB—FAST AND EASY!

The J-20 is fast *to* the job as well as *on* the job. Less than 8 feet wide overall, it trailer-loads easily and hustles from job to job behind a utility truck at safe, legal limit speeds.

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THE CLEVELAND TRENCHER CO., 20100 ST. CLAIR AVE., CLEVELAND 17, OHIO

THE GASSING GAME

By **JIM CLARK** • Gas & Oil Consultant, Houston

IT could be that one of the reasons gas producers have fought so long and so hard and so futilely for freedom from federal regulations is that they have failed to follow the example of the members of the American Gas Association, and many regional gas associations, in getting their story to the public.

This seemed to be the consensus of producers I approached during the past month on the subject. Producers simply have no public relations at all. That is, they have none that reaches the grass roots of public opinion such as the numerous programs and efforts by AGA-member companies.

Some producers, in fact, have no public relations and even refuse to participate in any program offered by the various oil and gas associations. And even these programs miss the general public by a country mile.

Most gas producers, especially the independents, are just a little sheepish about this. Yet they still seem to have little or no interest in the subject when it comes to putting up money for an organized program through some good agency. So, it seems they will continue to suffer the fate they all bemoan.

For the most part, producers seem dedicated to the proposition that they should carry on their public relations programs in Washington and the various state capitols. This they do very well. The only trouble is that it gets them nowhere. State legislators and national representatives go as far as their consciences and their constituents will let them go, but no further. Since there is considerable room for doubt in the minds of some congressmen over whether or not gas producers should be free from FPC regulation, this is not far enough.

Producers get absolutely nowhere with the consumer, except in the big producing states where most consumers are directly affected by the welfare of the industry. This is bad because the public in the non-producer states (and even in those which produce a little gas) have no appreciation of the producers' problem. And they seem to care less. In fact, gas producers are perfect targets for the specious arguments of those who favor continued producer regulations.

From the viewpoint of a few producers in Houston who were interviewed on the subject, all of them agreed that they need the kind of approach to their problems that AGA has come up with through Bing Crosby, Pat O'Brien, Jerry Lewis, Steve Allen, Donna Reed, Barbara Stanwyck, Janet Leigh, Tom Ewell, Jayne Meadows, and others.

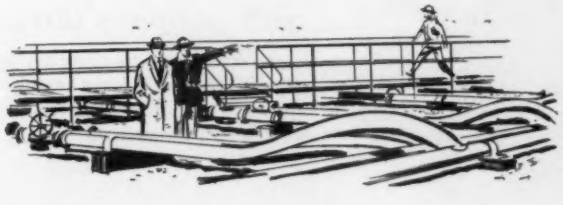
But the fact of the matter is they have a problem. The gas companies have commodities to sell, like ranges, clothes dryers, refrigerators, and other items. They can do this while spreading the good word about the superiority of gas over electricity, for instance. But the producers have no commodities to sell, except raw gas.

So, their programs would have to be based on messages that would develop understanding and good will. Yet such programs are quite expensive and today most independent gas producers are not too prosperous. About the only way they could raise the necessary funds for such programs would be to tack it onto the wellhead price of gas. But they can't do that because FPC would certainly not approve it.

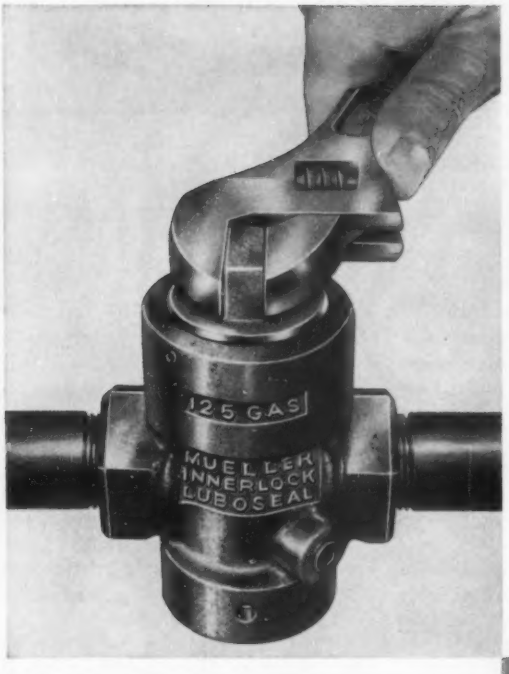
Maybe if they didn't have federal control they could add a portion of a penny a thousand a cubic feet to the price to help pay for their public relations program.

But if they didn't have federal controls they wouldn't need a public relations program to help get their long lost and most cherished freedom.

So, what the hell?

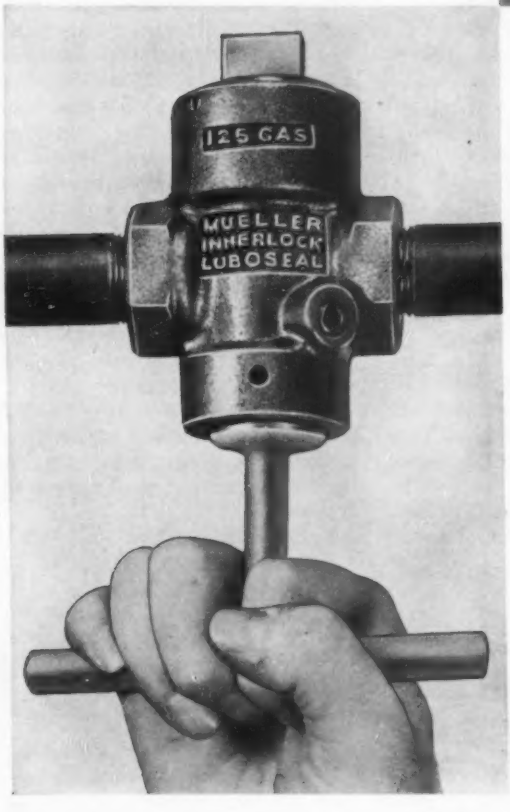


now, positive control of home service turn-ons ...the



anybody turns it off

The customer can quickly and easily turn this stop off with a common wrench. But he cannot turn it on with any tool normally found in the home. This unique stop simply and effectively prevents the customer from creating a dangerous situation in the home.



Gas company turns it on

When the gas company employee knows it is safe to do so, he quickly restores service with a special wrench available only to the gas company. Opening the stop automatically resets the stop for future shut-off use.

NEW MUELLER® INNERLOCK

another LubOseal *gas meter stop*

■ You can be certain that you are installing an absolutely safe gas stop when you install a Mueller LubOseal stop. The many advanced features found in all LubOseals assure you that many years from now it will be just as safe and dependable as it is today.

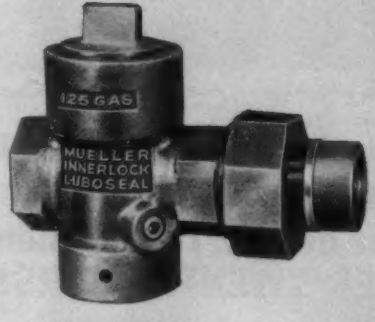
GAS TIGHT – O-ring seals at top and bottom of key absolutely prevent leakage to the atmosphere. Precisely ground key is lapped into body to prevent leakage through port. False ports in key and body protect generous sealing surfaces.

EASY TURNING – Four vertical grooves in key distribute grease over *all* sealing surfaces each time stop is turned off or on. Grease is stored under pressure by O-rings for perfect lubrication over long periods. Independent port permits easy relubrication of entire stop.

FULLY TESTED – Each stop is individually tested before shipping in both "off" and "on" position by submerging in non-corrosive liquid and applying 125 p.s.i. air pressure.

Iron Body—Bronze Key
Straight Way
Flat Head
Tamperproof
Working Pressure to 125 p.s.i.
Size—¾" only

H-11190 Innerlock LubOseal Stop
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread



H-11191 Innerlock LubOseal Stop
Inlet: Inside I.P. Thread
Outlet: Insulating Union

Write for complete information and specifications.

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Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited, Sarnia, Ontario

Carmen Logana, (left) foreman of meter shop, and J. Dugan, superintendent of Gas Measurement, Niagara Mohawk Power Corporation, Syracuse, N.Y.

"None of our Reeves-Vulcan synthetic diaphragms have ever needed replacement in OVER TWENTY YEARS!"

"Over 72,000 of our active meters are equipped with Reeves-Vulcan synthetic diaphragms," says Mr. Dugan. "In our new stepped-up program of meter maintenance – in which we can process 10,000 meters a month – we have ample opportunity to check the performance of these Vulcan diaphragms.

"As our meters come in for their seven-year check-up, the only diaphragms that need replacement at present are leather. None of the Vulcan synthetic diaphragms have needed replacement. This applies to those that were installed over 20 years ago.

"We have found that synthetic diaphragms sustain meter accuracy much better over long periods of time than leather diaphragms. That's why all our replacement meters are equipped with Reeves-Vulcan synthetic diaphragms. As the number of these diaphragms in use increases, we find a decrease in the number of meters that need adjustment."

How about *your* meter efficiency? You can get greater accuracy, longer service life and lower maintenance costs with Reeves-Vulcan diaphragms. There are models for practically every type of gas meter made. Both molded and crimped styles are available in any volume. Order Reeves-Vulcan synthetic diaphragms from leading meter manufacturers or directly from:

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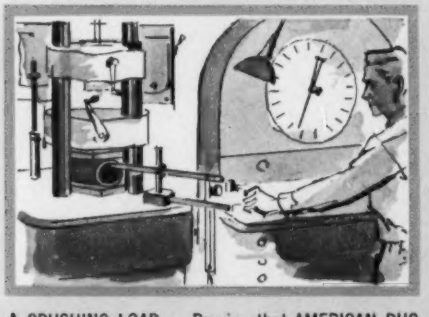
DUCTILE DIGEST

CHICAGO'S SUCCESS STORY! Peoples Gas Light and Coke Company of Chicago... the first and foremost user of ductile iron pipe for gas service... since 1954 has installed more than 100 miles of ductile iron pipe, most of which is AMERICAN DUCTILE IRON. Distributing gas at various pressures, this pipe is withstanding extreme frost conditions, unstable ground stresses and the impact of ever-increasing heavy traffic. To date, Peoples Gas reports: "No breaks!"

EASILY ASSEMBLED, BOTTLE-TIGHT JOINT! The AMERICAN Double-X joint, developed over 30 years ago, is accepted as the standard type of joint for ductile iron gas mains. Millions of feet of pipe equipped with this joint are now rendering dependable, trouble-free service. Its ease and speed of assembly, its ability to be installed in all types of weather, and its proven, leak-free performance in service... have earned the approval of utilities and contractors across the nation.



A CRUSHING LOAD... Proving that AMERICAN DUCTILE IRON® pipe has added safety factors to withstand rugged treatment in transit, in installation, in service. In laboratory tests on a sample, 12" long, cut from AMERICAN DUCTILE IRON® pipe, a 6" ring, .35" thick, withstood a crushing load of 24,850 pounds and a 20" ring, .57" thick, withstood a load of 19,180 pounds.

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AMERICAN CAST IRON PIPE COMPANY
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THE NEWEST REASON TO MAKE YOUR NEXT 2-TONNER A FORD

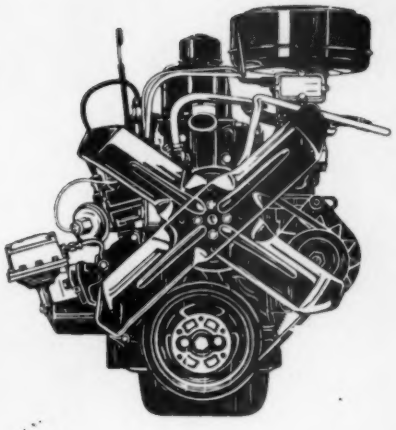
ALL-NEW FORD BIG SIX

262 CU. IN. TRUCK ENGINE

FORD DIVISION, Ford Motor Company

Ford C-600—America's lowest-priced* two-ton tilt-cab truck by $155 to $308! Here's tilt-cab maneuverability, service accessibility and load capacity, plus greater reliability. Maximum GVW 21,000 lb., GCW 32,000 lb.

*Based on a comparison of latest available manufacturers' suggested retail prices



Now, the rugged simplicity of a big 262-cubic-inch Six is combined with the dependability of heavy-duty, *exclusive-truck* engine design. Forged steel crankshaft, stress-relieved head and block, full-floating piston pins, stellite-faced intake and exhaust valves, positive exhaust valve rotators, and positive crankcase ventilation are typical of the advances you get in this powerful Six.

The new Big Six is one of *four* engine choices in Ford two-tonners for '61—including America's most popular truck V-8's. See your Ford Dealer. He will be glad to help you select the best engine for your job.

SEVEN MORE REASONS

WHY IT'S GOOD BUSINESS TO DO BUSINESS WITH FORD!

You save from the start with Ford's traditionally low prices, and your savings continue with low operating and maintenance costs. These facts are documented by certified test reports from America's foremost independent automotive research firm. Ask to see these reports. They're on file at your Ford Dealer's.

In addition to these dollar-and-cents savings, the following bonus benefits are yours with Ford Trucks:

1. **Rigid quality controls** give you the strongest safeguard of truck reliability ever. Modern, *exclusive-truck* manufacturing facilities, with emphasis on quality every step of the way, are designed to give you a Ford Truck that is as free from defects as a truck can be. Tangible results of these high standards are Ford's new warranties.

2. **Exclusive 100,000-mile warranty** (or 24 months) on 401-, 477- and 534-cu. in. Super Duty V-8's is the most liberal in the industry. Each major engine part (including block, heads, crankshaft, valves, pistons, rings), when engine is used in normal service, is warranted by your dealer against defects in material or workmanship for 100,000 miles or 24 months, whichever comes first. The warranty covers full cost of replacement parts . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter.

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4. **Special fleet financing** can be arranged by your Ford Dealer. It's available for owners of two or more trucks, and provides the opportunity to precisely tailor payments to your income patterns or depreciation schedules. This fleet-fitted financing offers substantial savings and frees your working capital.

5. **Sales engineers and service specialists** in 36 district offices are on call to solve special truck problems. Working with both dealers and customers, these experienced truck men represent another extra step Ford takes to provide your continued satisfaction.

6. **Replacement parts depots** at 26 strategic locations across the country quickly supply needed parts from ample stocks. Ford's entire supply system is geared to give you faster service and reduce costly downtime . . . *wherever* you are.

7. **6,800 Ford Dealers,** including 280 specialized Heavy Duty truck dealers, can keep your trucks ready to go wherever they go. From coast to coast, fast Ford service—gas *and* Diesel—is always close at hand.

From Super Economy pickups to Diesel-powered tractors, you can now fill every truck need up to 76,800 pounds GCW with a modern, money-saving Ford Truck.

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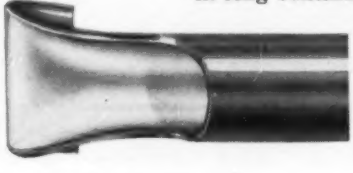
SEE YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" FOR PROOF!

Use of tin-lined copper tube for gas service replacement lines requires digging of only two holes as in this west coast installation.

Replace your gas service lines this easy, economical way...with PHELPS DODGE TIN-LINED COPPER TUBE!

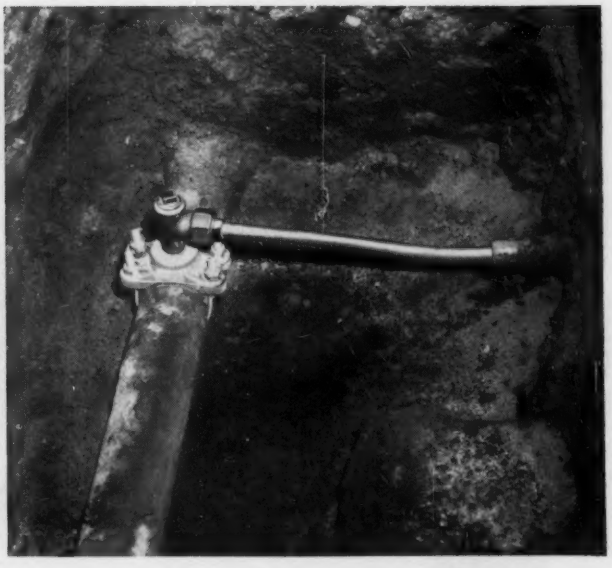
Savings can be made in labor costs by using Phelps Dodge tin-lined copper tube for replacement gas service lines. Pacific Gas & Electric Company recently adopted this tube for use in its main-to-meter lines.

The continuous, inseparably-bonded tin lining provides superior protection against flaking action that can plug orifices and lines and create dangerous hazards. The copper tube can easily be bent, flared or soldered and drawn through old steel or iron piping without protective wrapping.

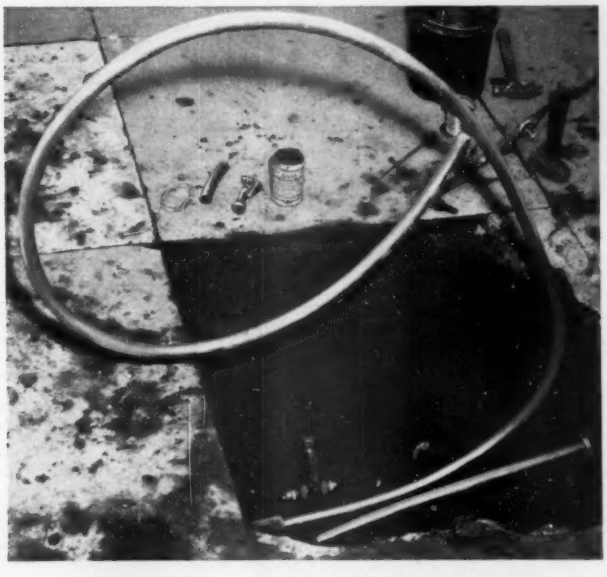


Phelps Dodge tin-lined copper tube is available in long continuous lengths and in sizes from ⅛-inch O.D. to 1 inch O.D. Other sizes available on special order. Sample and descriptive data sent on request. Just write to the address shown at right.

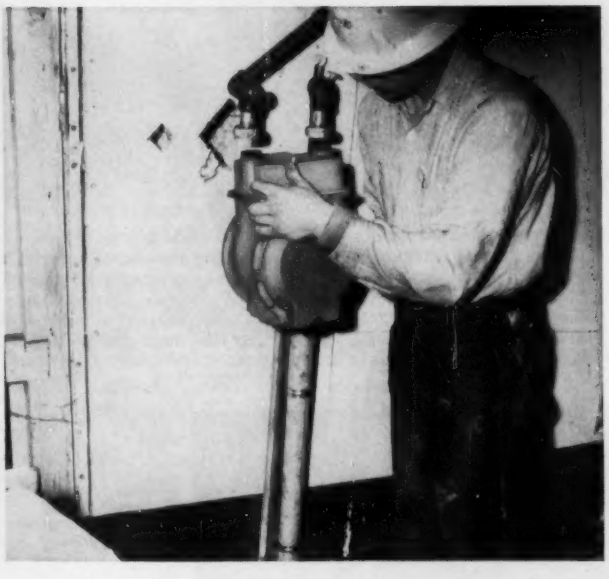
Workman standing in sidewalk hole where shut-off valve will be connected, is feeding tin-lined copper tube through old iron pipe to gas main.



Tin-lined copper tube emerging from old gas service pipe (right) is attached to 4-inch main in street.



Hole in sidewalk in front of residence showing tubing (right) pulled in from house and tubing (left) coming in from main to be connected to shut-off valve. Local code required shut-off valve to be placed outside of residence.



Tin-lined copper tube has been connected at ground level with steel riser pipe brought up to meter at residence.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
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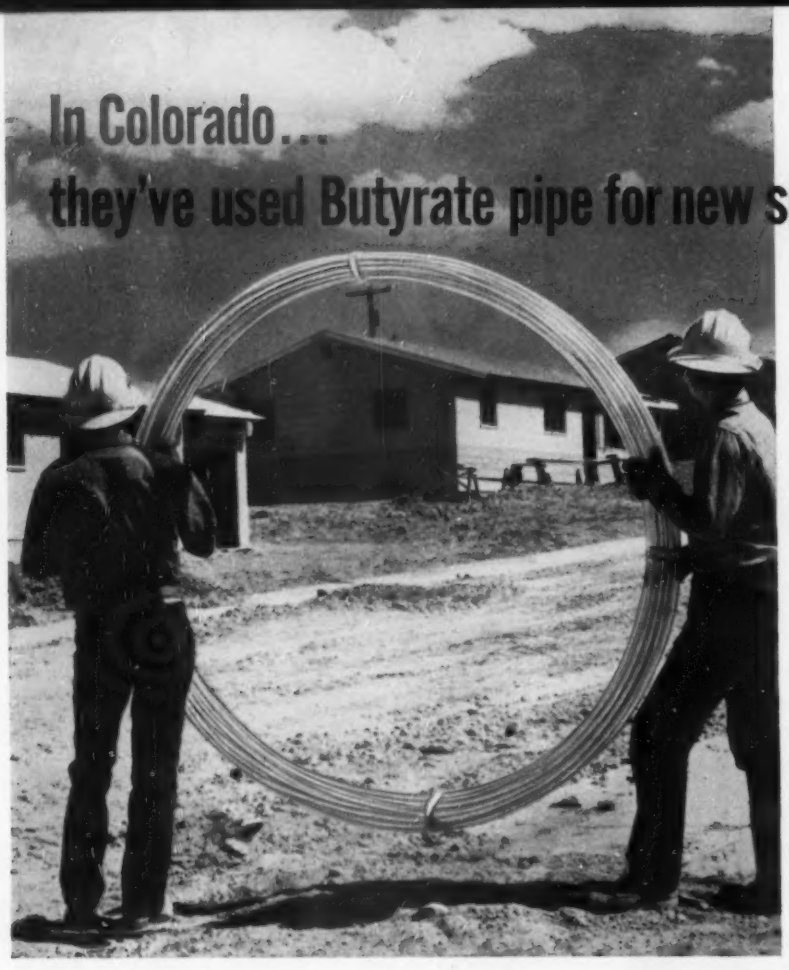
PD

In Colorado... they've used Butyrate pipe for new services since 1951



A field crew of Public Service Company of Colorado installs a new service line using pipe of Tenite Butyrate. Butyrate's superior flexibility permits this pipe to be shipped in coils, which often means that service lines may be one continuous length with no plastic-to-plastic joints. (An AGA report recommends that only Butyrate pipe be shipped in this convenient manner.) Crewmen appreciate the ease with which lightweight Butyrate pipe may be handled. Plastic-to-metal joints are made quickly, and this tough pipe needs no "babying."

For nearly a decade, Public Service Company of Colorado has cut costs with service lines of Tenite Butyrate plastic

Public Service Company of Colorado is among the leaders in the current trend towards the use of plastic pipe in the gas industry. Its engineers first experimented with Butyrate plastic pipe back in 1951 and have been using it ever since, not only for service inserts but for new services as well. The fact is, *over 50% of the Butyrate pipe used by this utility goes into new services.*

The advantages of Butyrate pipe for new services go beyond the low initial cost and rapid installation. The corrosion potential of a system using Butyrate pipe is greatly reduced, resulting in substantial long-term savings in maintenance and better service to customers.

Since 1943, over 1,000 miles of Butyrate pipe have been installed by three major utilities alone. It's the first choice in plastic pipe among major natural gas distributors.

Investigate the many advantages of pipe of Tenite Butyrate for new service lines, service inserts or mains. For further information plus a list of extruders of Butyrate pipe, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

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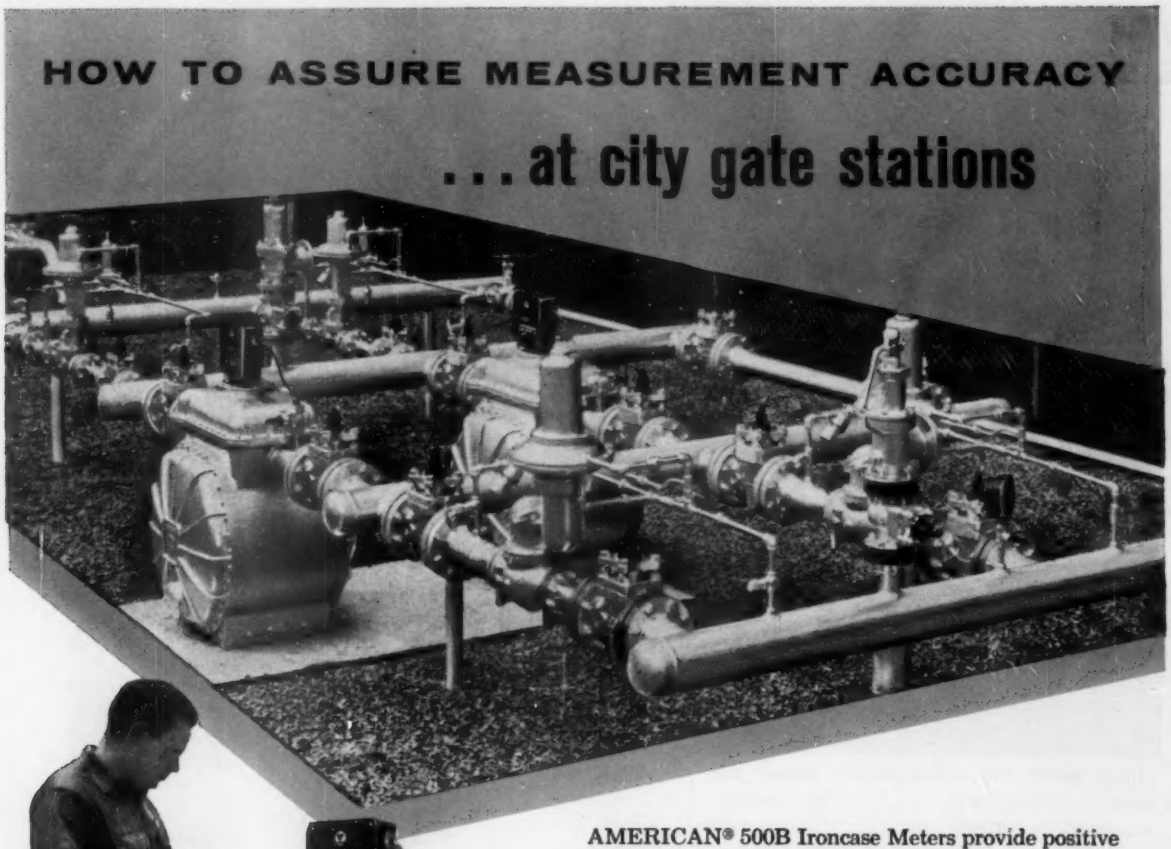
an Eastman plastic

HOW TO ASSURE MEASUREMENT ACCURACY

...at city gate stations



AMERICAN® 500B Ironcase Meters provide positive displacement measurement accuracy and dependability at this Granite State Transmission Company take-off station. High capacity Ironcase Meters provide accurate measurement under all conditions. Molded, 3-convolution Duramic diaphragms and other American quality features assure the economical and dependable handling for the big loads...with sustained accuracy at lowest cost. Capacities to 10,000 cfh. Working pressures to 250 psi in rugged Ironcase and to 100 psi in light weight Aluminumcase Meters.

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UTILITY MODEL 125 CROSS-MOUNTS BEHIND CAB. Overall length 70⅝". Complete with fuel tank. All controls in end of compressor frame for easy operation from the ground. Delivers 125 cfm @ 100 psi at fuel-saving 1750 rpm. Powered with Continental G-193 engine. Full information on request.

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Jaeger rotary compressors for utility installation and maintenance offer two specific advantages:

- **They produce the same air volume as other rotaries at characteristically slower engine speeds, using less horsepower, less fuel, less wear on engine and compressor.**
- **Air delivery is constant under all normal demands, due to closer, instant-acting control of engine and compressor. Speed modulation is completely stepless over the entire operating range. Tools operate at full pressure and efficiency at all times.**

Efficient multi-pass oil cooling keeps air temperatures low, automatic bypass eliminates "dry starts" in cold weather. Fuel tanks hold 8-hour supply. Portable models have extra large tool boxes.

75 to 900 cfm sizes. Send for Catalog JC-0 and name of Jaeger distributor in your city. THE JAEGER MACHINE CO., 661 Dublin Ave., Columbus 16, Ohio.

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MODEL 125 PORTABLES ON PIPELINE JOB: One of the country's most widely used compressor models. Full load speed 1750 rpm.

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MODEL 75, IDEAL FOR ONE HEAVY BREAKER: All the air you need to hold full pressure. Full load speed 1750 rpm.

Full protected by U. S. Patent 2931383.

Easy to Locate

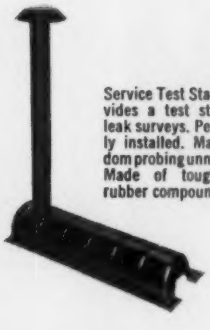
Leading gas utilities benefit every day with modern, permanent Handley Curb Boxes

Check the cost saving . . . time saving features of Handley Industries line of gas service equipment.

End call backs with attractive Handley outside meter boxes. Made of tough, resin-rubber compound*. Single meter cover shown. Models also available for double meter installation.

Roadway Valve Box. Designed to reduce the danger of vehicles damaging valves and gas mains. Constructed of tough resin-rubber compound, they telescope freely. Never rust. Never rot. Weight, only 9 lbs. each.

Handley Cathodic Terminal Box. Landscape engineered and non-corroding*. Leads are attached to the terminal block in the cap for easy testing. Magnetic top for easy locating.



Service Test Station. Provides a test station for leak surveys. Permanently installed. Makes random probing unnecessary. Made of tough resin-rubber compound*.

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Leading utilities the country over are standardizing on Handley lifetime curb boxes for sound business reasons. Here are just a few . . .

- Handley curb boxes are easy to locate. A built-in magnet and aluminum plate makes them easy to find with either electronic or magnetic finders.
- Handley telescope design prevents damage to both piping and service stops.
- 7 times lighter than cast iron, they're easier to handle . . . easier to store . . . and easier to install.
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Fully assembled, light-weight Handley curb boxes are easier, faster, and safer to install. Cut installation costs.

PROVE TO YOURSELF THAT HANDLEY CURB BOXES CAN PAY OFF IN GREATER EFFICIENCY AND ECONOMY FOR YOU. WRITE FOR THE FACTS TODAY.

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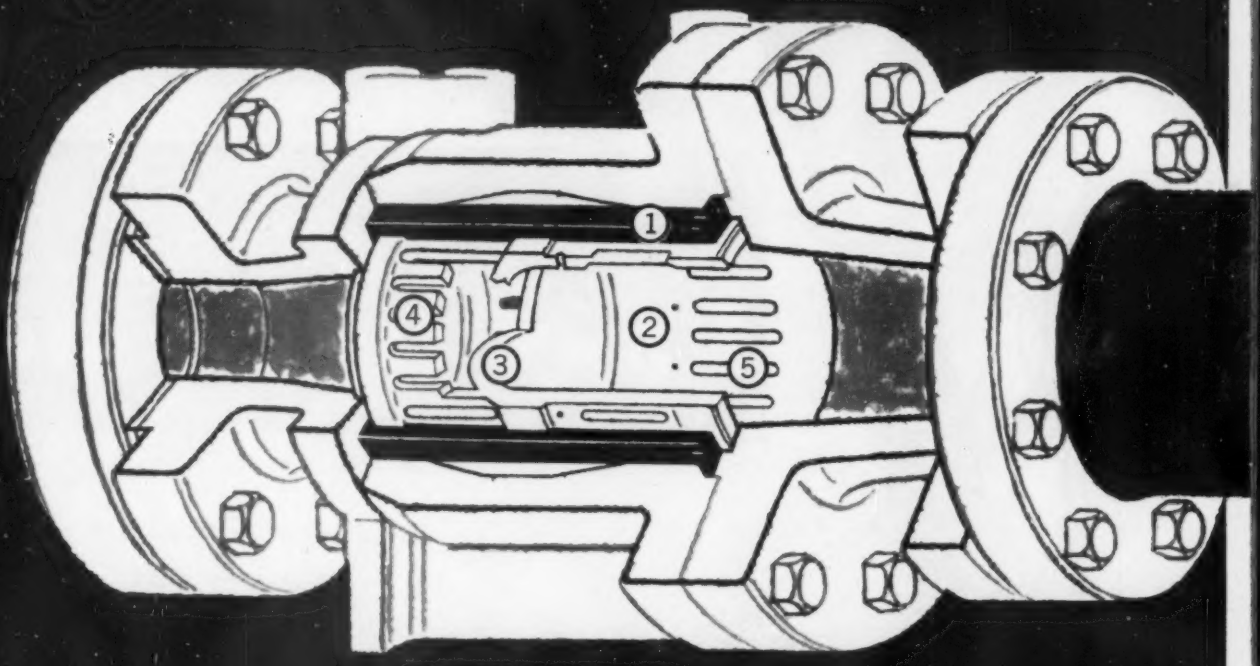

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GROVE FLEXFLO® REGULATORS' ONE MOVING PART ASSURES TROUBLE-FREE CONTROL

A flexible rubber tube (1) is the only moving part in the Grove Flexflo. Silent flexing and rolling action of the tube over a core (2) can never slam, stick or wedge. Core barrier (3) forces incoming fluids up through the inlet slots (4) under the tube and down through the outlet slots (5) The flexible tube assures positive shut-off even though foreign matter may be trapped between the core and the tube. Design simplicity assures long, maintenance-free life. Flexflo can be self operated, pilot operated or used with electrical, pneumatic or hydraulic Grove operators. Proven in pressure reducing, back pressure, remote, automatic shut-off and manual open-shut services. Cast iron or steel bodies, sizes from 1″ to 12″, working pressures for gas, water and most petroleum products to 1,500 pounds. Write for Technical Presentation No. 850.

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Efficient controls boost productivity of the heavy-duty "3010" Wheel Loader and power-matched backhoes. Single-lever control operates loader lift arms and bucket for rapid handling. John Deere Backhoes operate with simple two-lever control. Flush-digging model 51 has rotary boom cylinder which centers or slides to any of four off-center positions, moved by the unit's own hydraulic power.

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For a demonstration, contact your dealer through the yellow pages.

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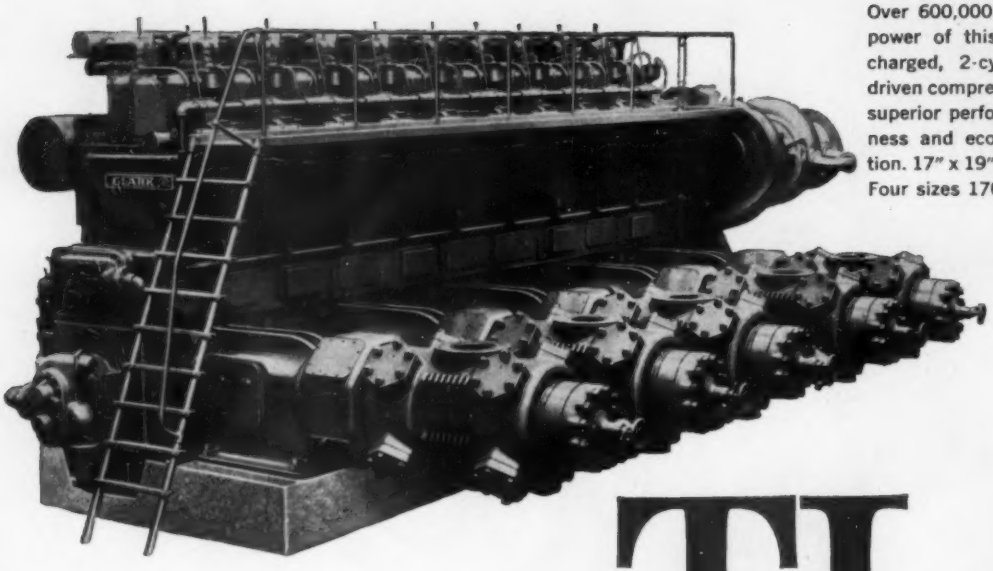
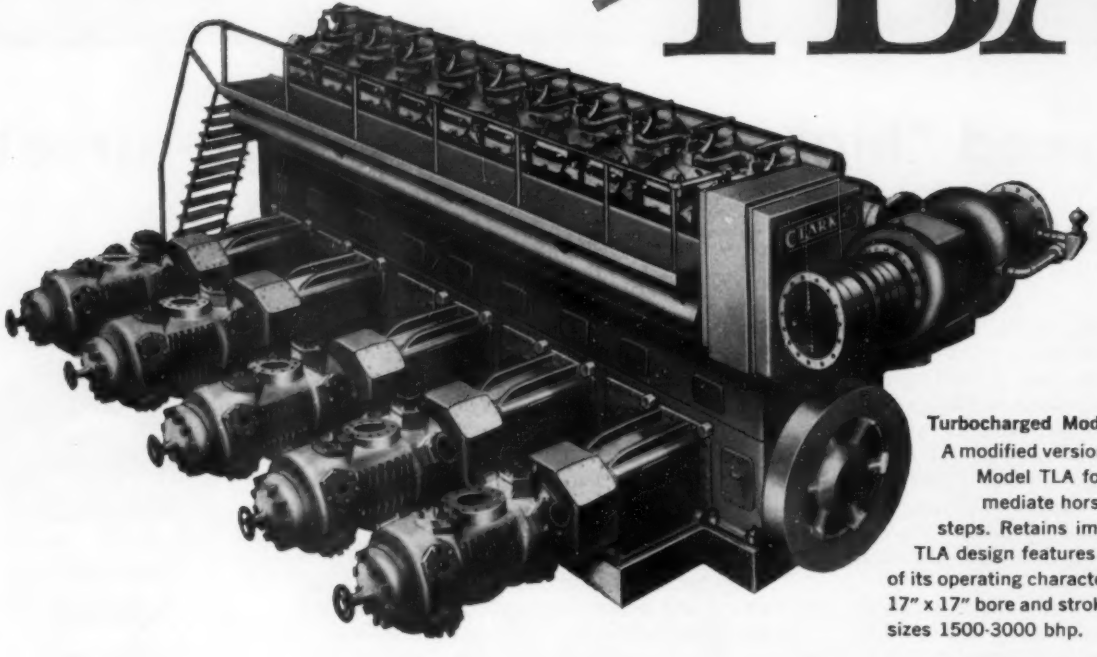


Popular Model TLA
Over 600,000 installed horsepower of this famous turbocharged, 2-cycle gas-engine-driven compressor testify to its superior performance, ruggedness and economy of operation. 17" x 19" bore and stroke. Four sizes 1700-3400 bhp.

the CLARK TLA TBA



Turbocharged Model TBA
A modified version of the Model TLA for intermediate horsepower steps. Retains important TLA design features and all of its operating characteristics. 17" x 17" bore and stroke. Four sizes 1500-3000 bhp.

Now you can name the horsepower—from 1500 to 3400 bhp—and name Clark with confidence. Clark has the compressor to fit your needs *exactly!*

With the addition of the TBA Series (a modified version of the time-tested Model TLA 2-Cycle, Gas-Engine-Driven Compressor), Clark now offers eight closely graduated sizes in this important horsepower range for pipeline and process applications.

The TBA is carefully matched to the TLA, giving you not only the best horsepower choice, but also a machine you can trust. Here's how it's done:

Same Heavy Duty Construction—The TBA incorporates the lower crankcase with thru-bolts, crankshaft, power pistons, compressor cylinders, aluminum bearings and running gear of the TLA—all thoroughly proved in exacting field duty. Both machines are specifically designed to handle the high power delivered by turbocharging.

Same High Efficiency Turbocharging System—The Clark designed, constant pressure turbocharger provides a flexible supply of combustion air that varies in proportion to the load placed on the engine. Thus the fuel-air ratio is inherently correct over the entire operating range.

Same Operating Flexibility—The turbocharger system coupled with a new automatic ignition timing control makes the TBA and the TLA ideally suited for variable speed, variable load applications. The fuel consumption curve remains essentially flat over a wide range . . . from reduced speeds at constant or variable torque all the way up to substantial emergency overloads at rated speed.

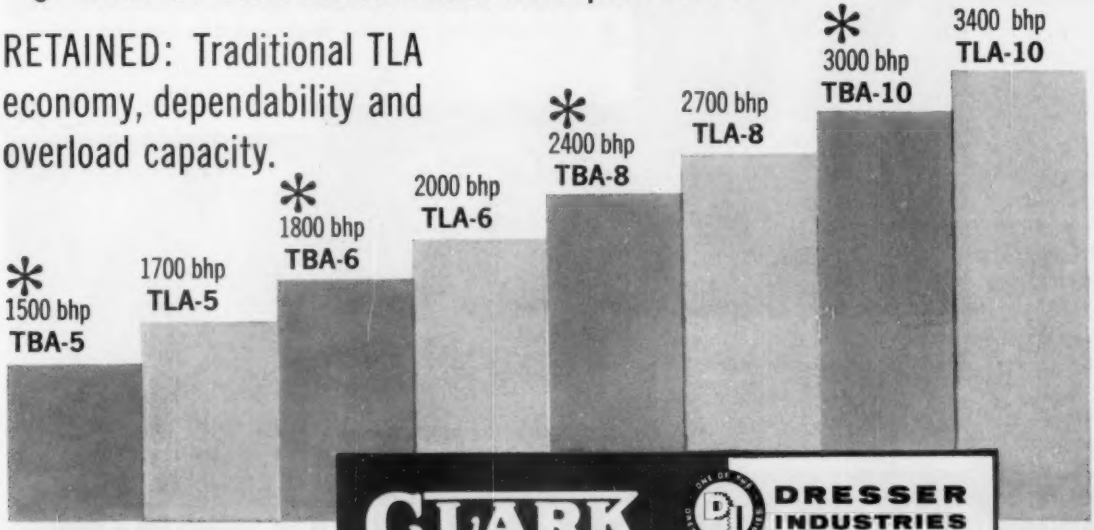
What's different, then? The stroke on the TBA has been shortened from 19" to 17", the external configuration of the power cylinders has been modified, and the ratings have been changed in accordance with the new stroke length. The TBA is built in five, six, eight and ten power cylinder models rated at 1500, 1800, 2400 and 3000 bhp respectively.

More facts are yours for the asking. Write for new Clark TBA Bulletin 206, and new TLA Bulletin 225.

Line is IN STEP with your pipeline or process requirements

✻ ADDED: New intermediate horsepower sizes

RETAINED: Traditional TLA economy, dependability and overload capacity.



CLARK BROS. CO.
OLEAN, N. Y.

CLARK GAS TURBINES

DRESSER INDUSTRIES INC.
OIL · GAS · CHEMICAL
ELECTRONIC · INDUSTRIAL

THE ANSWER TO CONNECTION PROBLEMS

BRANCH CONNECTIONS

MADE UNDER PRESSURE

The best and most economical method of making lateral or branch connections is to use Smith All Mechanical Joint Tapping Sleeves and Valves or Stopper Pieces. This method ELIMINATES GAS SHUT OFF and the permanent, leak-proof installation is achieved speedily by employing these simple procedures: 1. Block Sleeve Outlet Half under pipe, position side flange gaskets, bolt Sleeve halves together. 2. Position end joint gaskets; install follower rings, bolts and nuts. 3. Rotate Sleeve outlet flange to desired position, tighten follower ring nuts. 4. Tighten side flange gasket compression screws. 5. Attach Tapping Valve. The installation is complete and ready for tapping. 5. (Alternate) Stopper Pieces may be used in place of Valves when connections are made to low pressure mains and permanent shut off Valves are not needed; however, the use of Tapping Valves is recommended. The cost of the connection is reduced by quicker installation, elimination of skilled labor and costly jointing material. Bulletin will be sent on request.

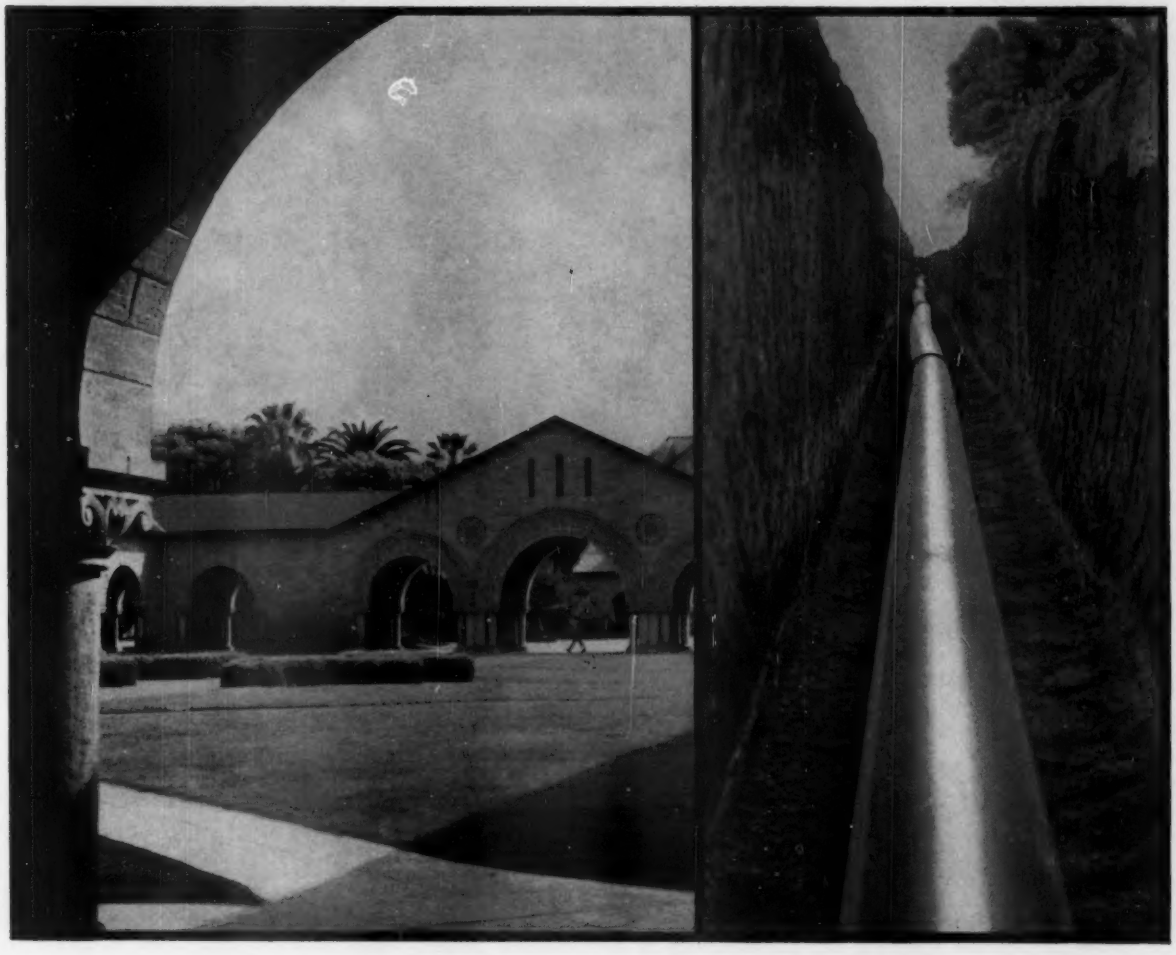
51

FIRE HYDRANTS · VALVES · SINCE 1896

THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

Naugatuck KRALASTIC
THE ORIGINAL ABS RESIN



Takes piping honors

Palo Alto, California, has installed another Kralastic® pipeline. One of many such installations in Palo Alto, this latest 6" line carries natural gas across a portion of the Stanford University campus.

Long service life and freedom from leaks are again the main reasons for the city's continuing use of ABS plastic pipe. Metal pipe, installed in other parts of the city, failed in a few years because of the area's highly corrosive soil. Kralastic, the original ABS resin, can't rust or corrode, has excellent dimensional stability and impact resistance.

Ease of installation has been another factor in the continuing use of Kralastic pipe. No expensive and cumbersome welds were necessary, no heavy equipment was required to install lightweight Kralastic pipe. The entire job, from trenching to backfill, was completed in only 5 days.

Kralastic pipe's reliability is an accepted fact, proved and documented through the more than 16,000 successful miles of it now in use. For information on how Kralastic can help you, call or write:

United States Rubber
NAUGATUCK CHEMICAL DIVISION
DEPT. A ELM STREET, NAUGATUCK, CONNECTICUT
KRALASTIC ABS RESINS • MARVINOL VINYLS • VIBRIN POLYESTERS

DIST. OFFICES: Akron · Boston · Chicago · Gastonia · Los Angeles · Memphis · New York · Philadelphia · CANADA: Naugatuck Chemicals · Elmira, Ont. · Cable: Rubexport, N.Y.

now try this one for SIZE!

A 7000 cfh* line-mounted Rootsmeter less than 18″ long

Now you can have the advantages of both rotary-positive-displacement metering and line-mounting in a 7000 cfh Rootsmeter, Model 7M125, as well as in the already widely accepted 3000 cfh model.

Rootsmeters are accurate through wide ranges of pressure and flow—unaffected by fluctuations. And because of Roots proved operating principle, you can be sure the accuracy is permanent.

The new meters are designed for easy line-mounting. The 7000 cfh model is less than 18″ long, and the 3000 cfh model is only 14″ long. Connections are flanged to ASA C.I. standards, and line-mounting Rootsmeters require no special supports for simple horizontal or vertical installation.

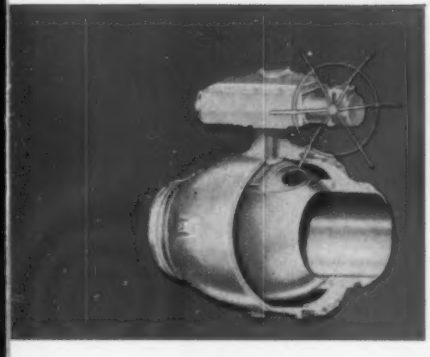
There are a lot of other advantages in these Line-Mounted Gas Meters, too. You can easily read total flow through the convenient protective lens of the direct-reading volume register, yet the register itself is enclosed entirely within the meter case, eliminating problems incurred with external counters. And if you wish, the meter can be easily instrumented. Maintenance is simple: just replenish the oil occasionally; convenient bulls-eye oil-level gauges make checking easy. There are no internal valves, orifices, or diaphragms to wear or be damaged, and no stuffing boxes to maintain. Testing is easy too, with simple connections provided for standard proving procedures.

Whether your problems are in gas production, transmission, or distribution, or if you meter industrial or institutional gas, you'll find Line-Mounted Rootsmeters the most accurate and dependable, easiest to install, and most convenient gas meters you've ever used. Call your Roots-Connersville engineer or write for details of all the advantages of new Line-Mounted Rootsmeters.

*Dial Rate

ROOTS
CONNERSVILLE
DRESSER INDUSTRIES INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

ROOTS-CONNERSVILLE BLOWER DIVISION
900 W. MOUNT STREET, CONNERSVILLE, INDIANA
In Canada—Roots-Connersville Blower (Canada) Ltd., 629 Adelaide Street, West, Toronto



in for life: Once you weld a Rockwell Hypresphere valve into your pipeline, it's in for life—you'll never need to see the inside again. The seats in these spherical, full-opening valves are renewable forever, without taking the valve apart. And you know that today, tomorrow or any time in the lifetime of the line you need quick, sure shut-off, you'll get it with Hypraspheres. We'll be happy to send you complete information.

ROCKWELL-Nordstrom VALVES
another fine product by
ROCKWELL

Write to:
Rockwell Manufacturing Company
101E N. Lexington Ave.,
Pittsburgh 8, Pa.
Canadian Valve Licensee:
Peacock Brothers, Ltd.
Box 1040, Montreal, Quebec
Rockwell International, S.A.
81 Rue de la Servette
Geneva, Switzerland

Please send me Bulletin V-618.

Name_____

Company_____

Street_____

City_____ Zone____ State____

MORE

MORE

MORE

MORE

MORE METER FOR YOUR MONEY

...and you can prove it.

Compare the capacity of the Superior AL340 with any hardcase meter you are now using in the 300-400 range. Check the performance curves, check the output, check the price.

Most meters show rated capacity when tested with ½" water column and 0.60 sp. gr. gas. All Superior aluminum case meters are rated with 0.64 sp. gr. gas. This is *extra* capacity.

Extra capacity, at no extra cost, stretches your "capacity dollar" and at Superior we're dedicated to providing more and better means for stretching your capacity dollar. That's why you should consider Superior for your metering needs. *You can specify Superior with confidence.*

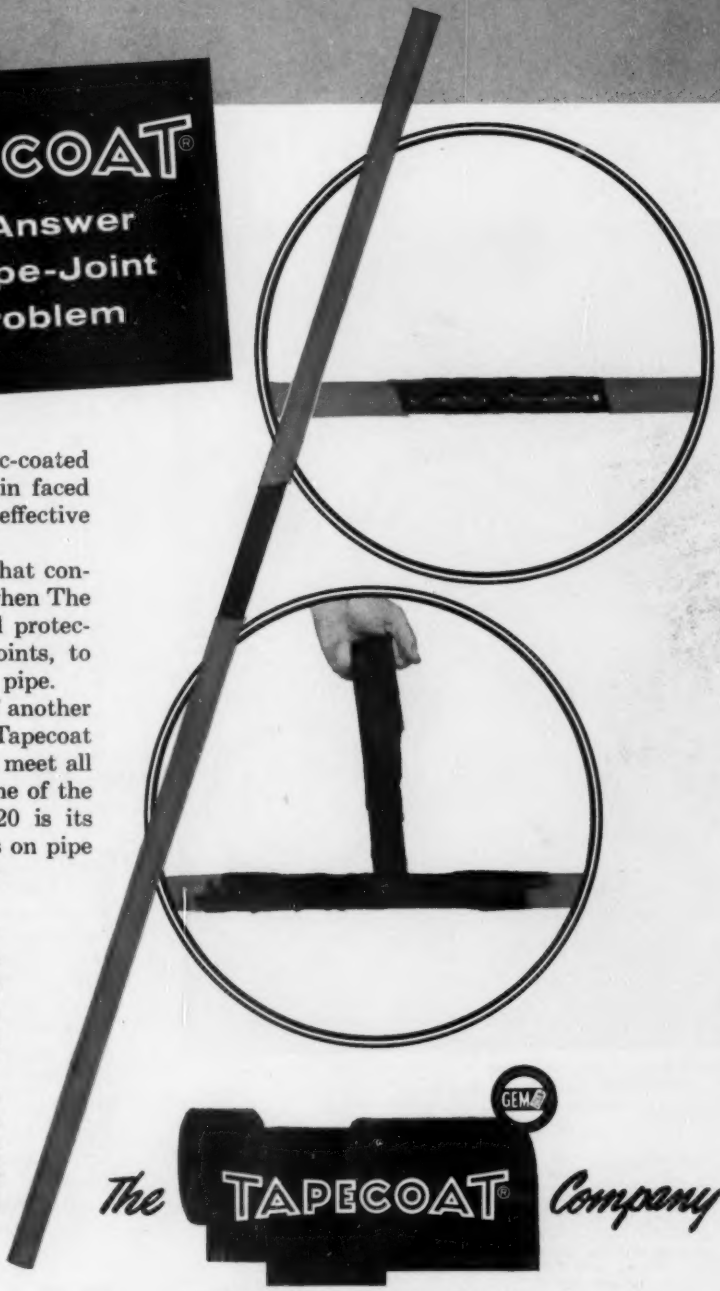
neptune
for a better measure of profit

SUPERIOR METER DIVISION
NEPTUNE METER COMPANY
167–41st Street, Brooklyn 32, N.Y.

Branch Offices: Atlanta • Brooklyn Chicago • Columbus • Dallas • Denver Los Angeles • Louisville • North Kansas City, Mo. • Philadelphia Area (Bala-Cynwyd) • Portland
In Canada: Neptune Meters Ltd. Toronto • Calgary • Halifax • Montreal Vancouver • Winnipeg

HISTORY REPEATS ITSELF!

Again... TAPECOAT® Provides the Answer For Today's Pipe-Joint Protection Problem



With the introduction of plastic-coated steel pipe, users are once again faced with the problem of providing effective protection at the joints.

This is the same situation that confronted the industry in 1941 when The Tapecoat Company originated protection in tape form for pipe joints, to match the mill coating on the pipe.

Now . . . with the advent of another method of mill-coating pipe, Tapecoat has developed Tapecoat 20 to meet all joint-coating requirements. One of the many features of Tapecoat 20 is its adaptability for coating joints on pipe protected with high-density polyethylene.

Tapecoat 20 provides a compatible bond, not only to the bare pipe, but also to the jacket on the mill-coated pipe—with no bridging of the tape from the jacket to the bare pipe.

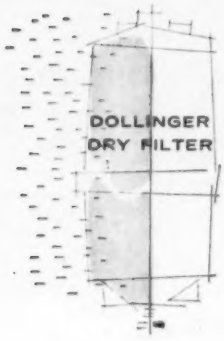
The illustrations show joints protected by Tapecoat 20. Note joint (at right) demonstrating effectiveness of bond even after Tapecoating has been pulled away from pipe surface.

Write for full details today.

The TAPECOAT® *Company*

1535 Lyons Street ★ Evanston, Illinois
Telephone: DA 8-5220

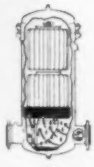
Sales and Service Offices in New York, Pittsburgh, Charlotte, Birmingham, Houston, Lincoln, Tulsa, Minneapolis, Salt Lake City, San Francisco, Los Angeles and Seattle.



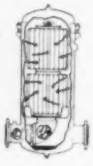
SPECIALISTS
FOR 40 YEARS

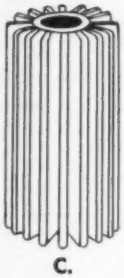
HELP ELIMINATE DAMAGED VALVES, CLOGGED PILOTS

Dollinger Staynew Gas Filters remove dry oxide, sticky oil deposits, and other foreign matter from natural gas lines at district regulator stations, industrial and power plants, and large meter or control stations. On manufactured gas lines, Staynew Gas Filters effectively stop lamp black and moisture from entering district regulators and pilots.

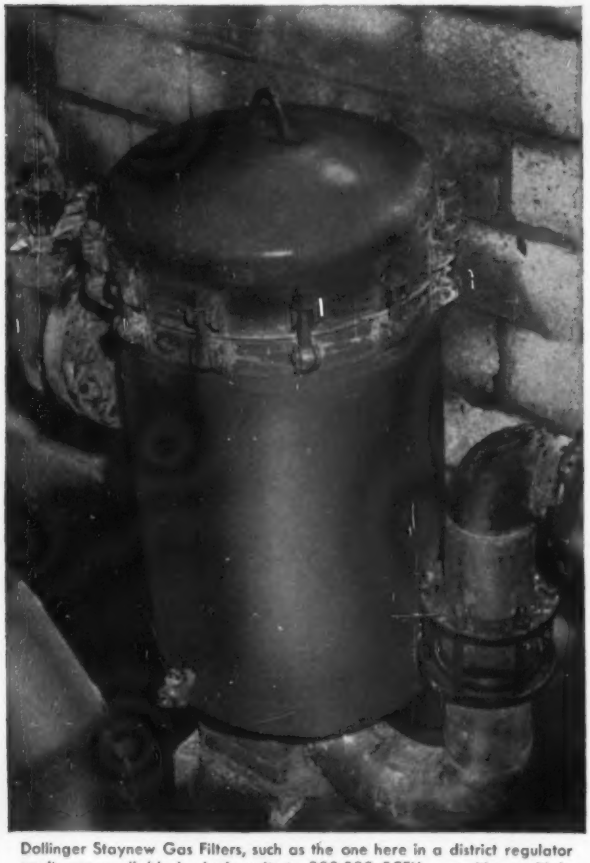

A.

Assure more efficient filtration. Staynew Gas Filters employ a unique double action principle that cleans gas by two processes. MECHANICAL SEPARATION (A) directs the flow of gas into the base at high velocity, where water, oil and heavier particles of rust, scale and dirt are deposited. Then the gas, having been mechanically cleaned, is FILTERED through the Radial Fin insert at low velocity (B) removing any remaining particles. The Radial Fin construction (C) is unequalled as an efficient form of pipe line filtration. It offers the largest possible active filtering area for the space it occupies—this means high efficiency at low resistance without constant servicing.


B.


C.

Accessible and flexible construction. Interior parts of Staynew Gas Filters are easily exposed for inspection and cleaning. Loosening of swing bolts allows removal of the housing without breaking pipe connections. Inlet and outlet connections of Staynew Gas Filters may be varied to suit individual installation requirements.


Dollinger Staynew Gas Filters, such as the one here in a district regulator vault, are available in single units to 300,000 SCFH capacities, multiple units for larger capacities.

If you have a gas filtration problem, consult your local Dollinger representative. He can offer time-saving economical solutions. Or, write for Bulletin 290-R, Dollinger Corporation, 68 Centre Park, Rochester 3, N. Y.

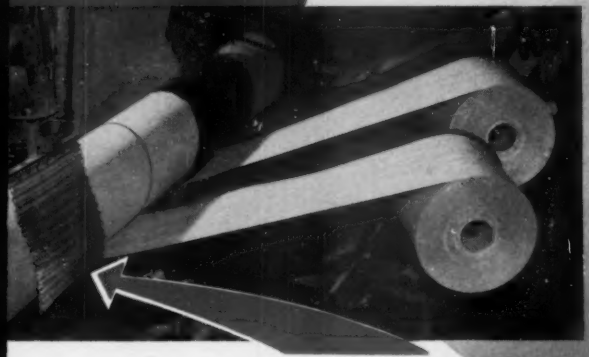
PROTECTOMOTOR

STAYNEW FILTERS

DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Pinholes are fatal in pipe protection, too!



• Electrical Inspection (arrow) is provided during processing of pipe. This automatically inspects the coating as it is applied, and guards against all "holidays" in the protection.

Pipe Line Service Methods eliminate costly failures of hit-or-miss pipe coating

Electrical Inspection is another PLS control for unvarying quality. This steel mesh screen, designed by PLS Engineers, is charged with thousands of volts. Every square inch of coated pipe passes under this screen and is electrically tested. When voids or holidays in the coating do occur, they are immediately detected and properly repaired. Scientific thoroughness by PLS provides you with uniform protection on every pipe length. Get full details from the Pipe Line Service sales office nearest you.

Sales offices at all plant locations . . . and
Atlanta, Georgia—Dallas, Texas
Lincoln, Nebraska—Houston, Texas
Syracuse, New York

Pipe Line Service Corporation

GEM

General Offices and Plant: Franklin Park, Ill.

Quality pioneers in coating and wrapping pipe for a quarter century

SEEN IN ALL THE WORST PLACES

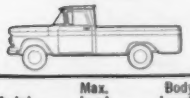
They keep showing up in places most trucks can't get to because it takes an awful lot to stop these sure-footed Chevy four-wheel-drive models! Where the job calls for the mobility of a mountain goat teamed with the stamina of a mule, you'll find no finer way to get your work done. And for 1961 the Chevrolet 4-wheel drive lineup is a full dozen models long. You can pick from a *wide* selection—one that's sure to include the best answer to your toughest traction-plus requirement!

■ Put any one of these 4-wheel drive Chevies on any job—then watch it dig in and *go!* Come what may in the way of mud, snow, sand, loose gravel, creek bottoms, swampland or freshly plowed ground, you can rest assured that the extra bite of up to double traction—plus stump-jumping road clearance—will get you through every time.

And you'll like the way a Chevy 4x4 rolls down the highway in smooth 2-wheel drive, ready to give you 4-wheel traction at the flick of a lever, the moment you need it. You'll appreciate the no-clutch shifting ease of the transfer case (whether moving or standing still) and the extra versatility that's yours with a choice of 4-wheel direct or underdrive.

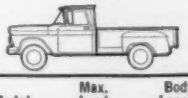
If you prefer the extra snap of spirited V8 power, it's yours at nominal extra cost in any model. Also available at extra cost are heavy-duty 3-speed and 4-speed transmissions and a wide choice of traction tires. You can tailor your Chevy 4 x 4 to fit your needs exactly. Get the full details and turn your traction problems over to Chevy—the traction champ of them all!... Chevrolet Division of General Motors, Detroit 2, Michigan.

FLEETSIDE



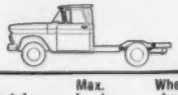
Model	Max. Load	Body Length
K1434	1400 lb.	6½′
K1534	1300 lb.	8′
K2534	2950 lb.	8′

STEPSIDE



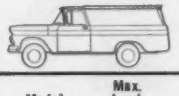
Model	Max. Load	Body Length
K1404	1450 lb.	6½′
K1504	1350 lb.	8′
K2504	3050 lb.	8′

CHASSIS-CAB

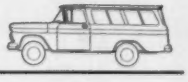


Model	Max. Load	Wheel-base
K1403	1900 lb.	115″
K1503	1850 lb.	127″
K2503	3500 lb.	127″

PANEL



CARRYALL



Model	Max. Load	Body Type
K1405	1300 lb.	7½′ Panel
K1406	1000 lb.	Carryall (panel type rear doors)
K1416	1000 lb.	Carryall (tailgate and liftgate)

SEND COUPON TODAY

PLEASE SEND COMPLETE INFORMATION ON THE CHEVROLET 4-WHEEL DRIVE LINEUP TO:

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Company_____ No. of trucks owned_____

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City_____ Zone_____ State_____

Fill out and mail coupon to:
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Chevrolet Motor Division
General Motors Corporation
Detroit 2, Michigan

37

1961 CHEVROLET STURDI-BILT TRUCKS

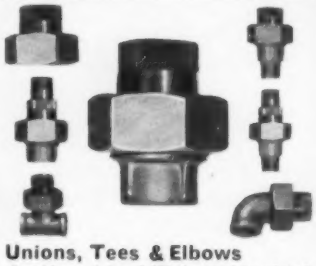
CHEVROLET

Eclipse

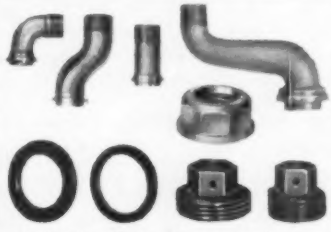
GAS SERVICE PRODUCTS

For Safer, More Attractive and Economical Meter Installations

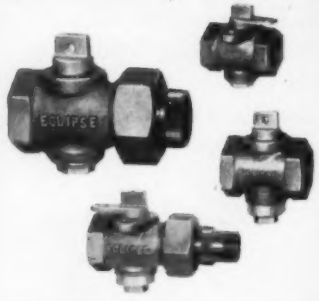
Return Bends
Cut down number of threaded joints, save pipe fitting time, and assure parallel piping in your meter sets. Plain and Wedgeseal-Insulated, female by male and female by female. Bulletin No. 500-2.



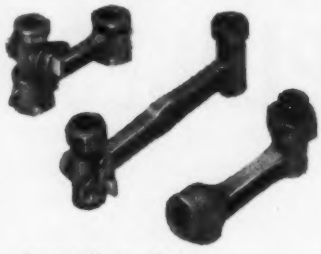
Unions, Tees & Elbows
A wide variety of Wedgeseal-Insulated types with versatile combinations of male or female threaded ends. Accurate, time-saving, and effective insulation. Bulletin No. 400-2.



Swivels, Nuts, Accessories
"Certified" construction, accurately machined. Complete stock of straight, offset and adapter swivels and nuts. Bulletin No. 300 for swivels and nuts; No. 1900 for accessory items.



Gas Cocks
Iron body, red brass core with either standard or "Retained Key" construction. Also furnished with integral Wedgeseal-Insulated union either male or female. Bulletin No. 600-2.



Rigid Meter Bars
Union, sleeve or compression type. Union type available in Wedgeseal-Insulated, standard gasket, or brass-to-iron ground joint — with standard key or "Retained Key" integral gas cock available. Bulletin No. 200-2.

You benefit from one source of supply, one responsibility with Eclipse Gas Service Products. Dense, solid castings — free from porosity — are used throughout with accurately machined collars, pilots, and threads.

Eclipse Wedgeseal-Insulated union, meter bar, gas cock, and return bend packages offer 100% protection against stray or induced house currents . . . prevent electrolytic corrosion . . . the multipurpose units cut down on the number of threaded joints in your gas service piping and meter installations. The integral insulator cannot be left out — nor will it shear off, pull out, or crack during service. Ask for descriptive bulletins and specification sheets.

Eclipse®

GAS SERVICE PRODUCTS DIVISION
ECLIPSE FUEL ENGINEERING COMPANY
1109 Buchanan St., Rockford, Illinois

Start with the FISHER type 66 for

EFFICIENT COMBUSTION CONTROL

In low pressure gas regulation....

FISHER 66

This self-operated pressure reducing regulator insures maximum combustion efficiency despite varying inlet pressure or pressure drops in plant piping. Widely used on gas engines and burners in commercial and industrial applications, Fisher Type 66 utilizes a balancing diaphragm which equalizes stem forces and provides minimum lockup with high or low inlet pressures. A pitot tube compensates for increased flow and maintains constant reduced pressure through wide range of flows. Series also includes Type 66Z for regulation at near, or below atmospheric pressures, and for exceptionally precise control Type 66ZZ can be supplied. *Send for Bulletin P-66C.* Fisher Governor Company, Marshalltown, Iowa. Plants in Woodstock, Ont., Rochester, England. Butterfly Valve Division: Continental Equipment Co., Coraopolis, Pa.

BODY SIZES AND PRESSURE RANGES

TYPE	BODY SIZES	MAXIMUM INLET PRESSURE	REDUCED PRESSURE SPRING RANGES
66	2" Screwed; 2", 3" and 4" 125 lb. ASA Flanged	5 psi**	4" to 11" W.C.* 8" to 28" W.C.* 2" to 5" W.C. 4" to 8" W.C. 7" to 12" W.C. 10" to 17" W.C. 14" to 28" W.C.
66Z		5 psi	−1" to +2" W.C.
66ZZ		2 psi	−¼" to +¼" W.C.

*Must have 1 psi minimum differential.

**5 psi is maximum operating pressure. However, a momentary inlet pressure up to 25 psig is allowable.

If it flows through pipe anywhere in the world ...chances are it's controlled by.....

FISHER® Controls SINCE 1880

MUSCLE, FOR MILES AND MILES

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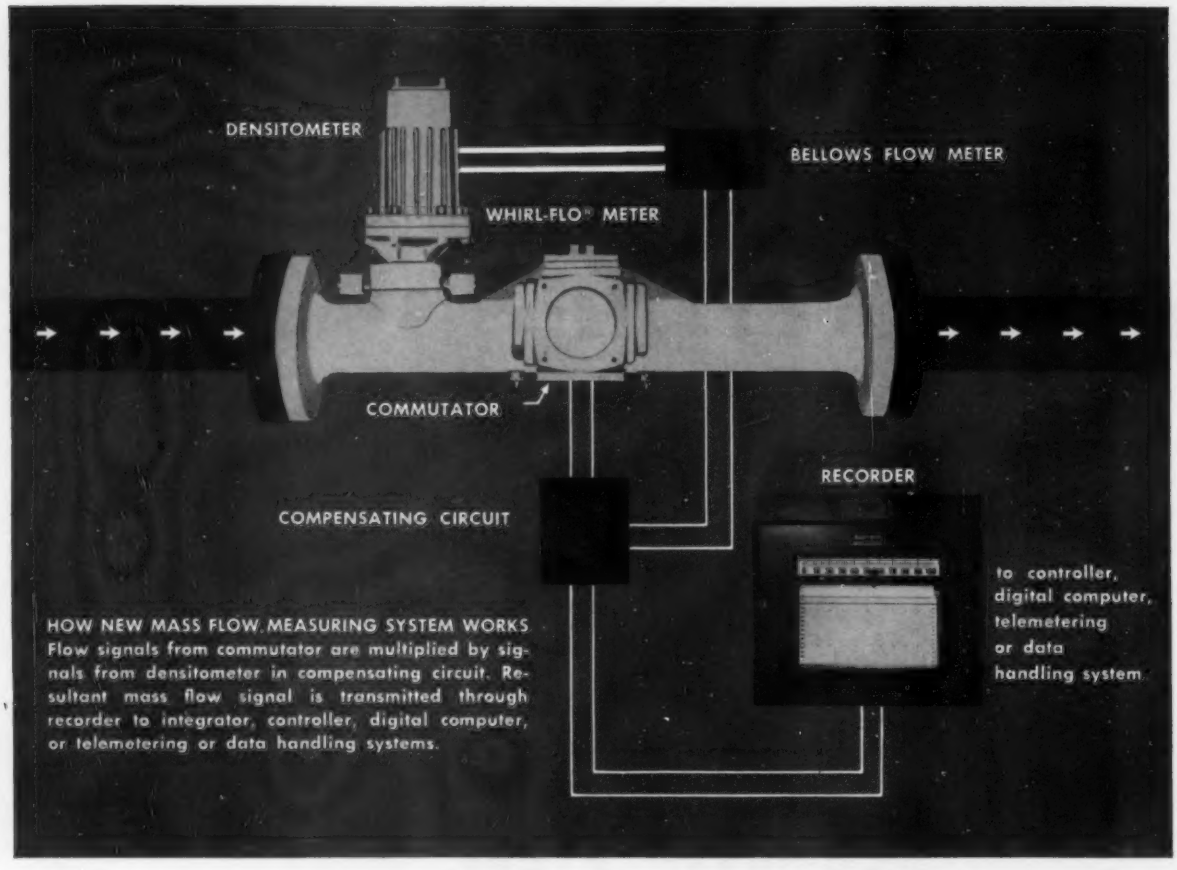
DENSITOMETER
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COMPENSATING CIRCUIT
to controller, digital computer, telemetering or data handling system
HOW NEW MASS FLOW MEASURING SYSTEM WORKS
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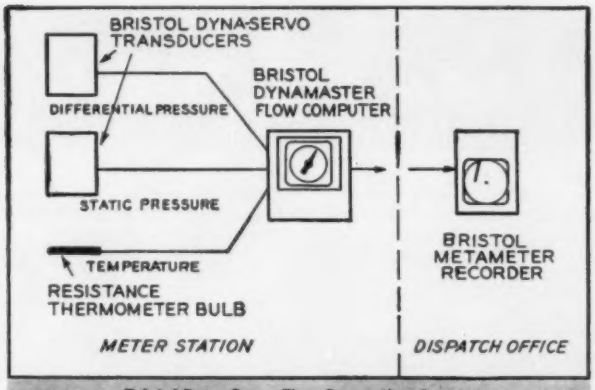
Since instantaneous flow rates are continuously totalized and computed at each metering station, only one telemetering channel and only one Metameter* receiver are required to maintain a fully corrected, up-to-the-minute record of flow conditions at the central dispatch office.



Bristol Dyna-Servo Flow Computing System

TELEMETER, COMPUTE, or LOG

CENTRAL STATION COMPUTING

Bristol's Meta-Slidewire flow computing system is designed for gas pipeline and distribution systems requiring a complete description of remote station conditions at the dispatch office.

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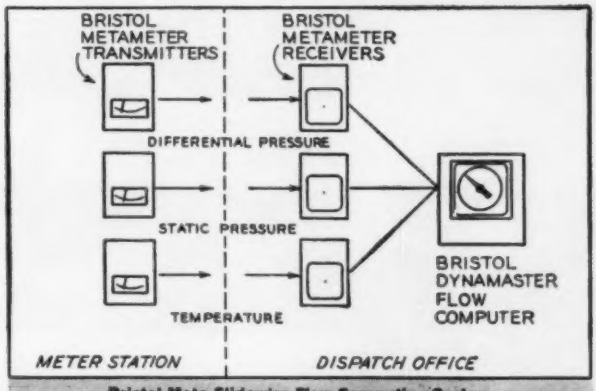
Meta-Slidewire computing facilities can be added to existing Metameter raw data telemetering systems.



Bristol Meta-Slidewire Flow Computing System

... with these advanced **BRISTOL** systems, specifically designed for the gas industry

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Modular Data-Master loggers provide a convenient, fully automatic digital record of every kind of telemetered data—computed and integrated flow (as shown at right), or instantaneous line pressures, flow rates, gas temperatures, and differential pressures. Data-Master loggers can be added to existing telemetering systems with little or no modification of existing instrumentation. 1.5

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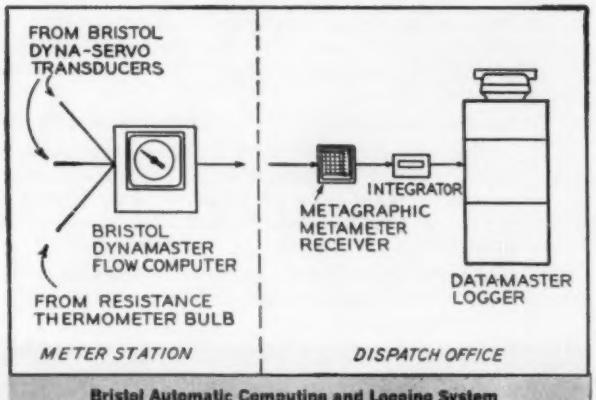

Bristol Automatic Computing and Logging System

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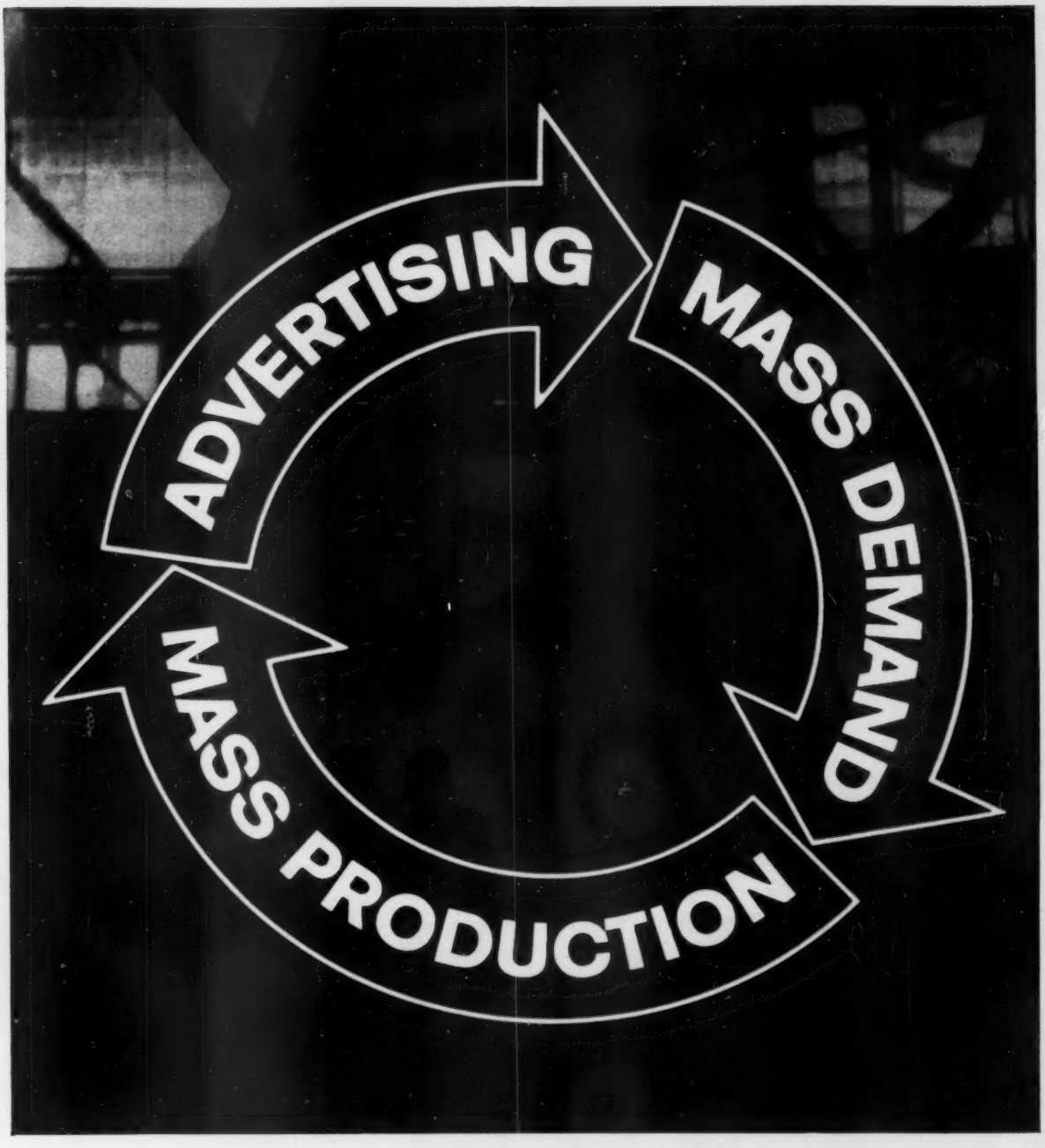
For detailed information about these advanced Bristol systems and their applications, write: The Bristol Company, 119 Bristol Road, Waterbury 20, Conn., a Subsidiary of American Chain & Cable Company, Inc.

BRISTOL ... leader in instrumentation for the gas industry

AUTOMATIC CONTROLLING, RECORDING, LOGGING AND TELEMETERING INSTRUMENTS



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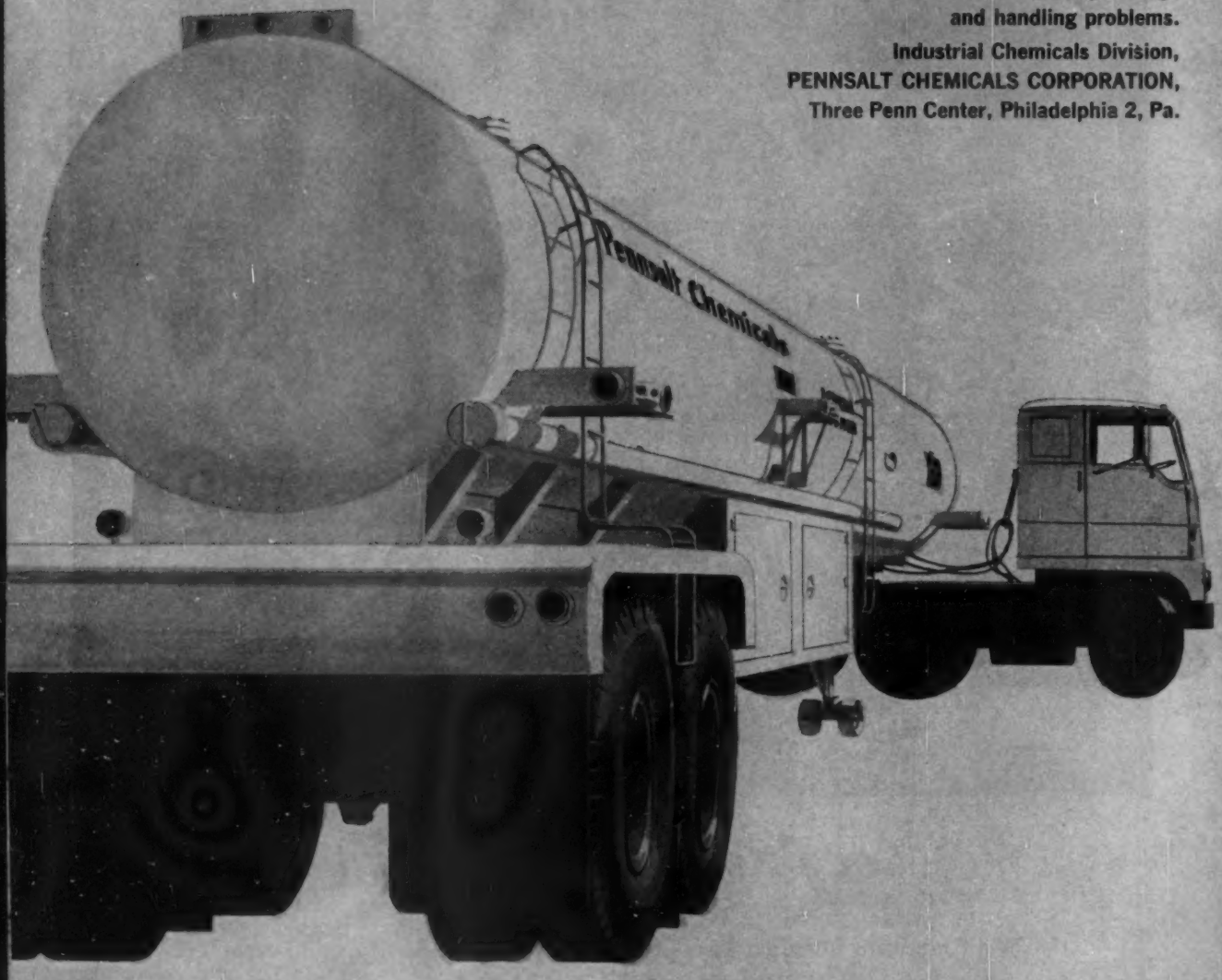

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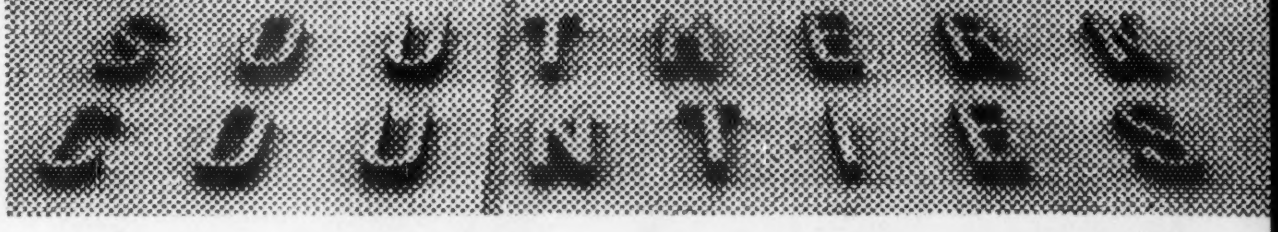
GAS

PERIODIC METER CHANGING



Beginning a three-part series by Albert D. Petersen, manager of customer service at Southern Counties Gas Co., Los Angeles. This installment covers the development of a way to change domestic meters without interrupting service. In succeeding installments, Petersen will discuss SoCounties' approach to meter-changing truck design and to scheduling meter changing.

IN California, a Public Utilities Commission regulation requires that all meters be changed every 10 years or less. Thus, periodic meter changes are a big part of the customer service work load for California gas utilities.

During World War II, meter changing, which required entry to the home to turn off and relight appliances, became increasingly difficult for Southern Counties Gas Co. because more and more housewives had jobs. SoCounties personnel, accordingly, recorded more and more "not home" calls. Unable to enter the house, the servicemen would call back again and again to change the meter.

Once again, necessity mothered an invention—the hot change device. Today, this device—greatly improved—enables SoCounties to change more than 90 per cent of its 770,000 meters without interrupting service—and without making return calls because the customer is not home.

The device evolved from a combination of three separate things: (1) an alternate source of gas; (2) a rubber bag which allowed making a connection to the houseline without interrupting service; and (3) a hollowed-out rubber expansion plug, the means for supplying gas from the alternate source and preventing back-flow from the houseline.

Each of these ideas, in itself, was not new; but had been previously used in one way or another by SoCounties. Bottled natural gas provided temporary service to customers. A rubber bag had been used to connect recording pressure gauges to customers' meter sets

Here's the hot change device in its intermediate stage of development, just after the war and the decision to "go all out" with it, using it to change all old meters.

without shutting off the gas. Our standard procedure for turning off gas called for a solid rubber expansion plug in the inlet tee of the meter set. Therefore, it was just a matter of a little ingenuity to put these things together to come up with the first hot change device.

The original rubber bag was made from a piece of an automobile innertube, vulcanized closed at both ends. Two holes were cut in one side of the tube, one near each end. One hole, about ½ in. in diameter, was for slipping the bag over the meter set tee. The other, about 2 in. in diameter, enabled the serviceman to slip his hand through to work inside the bag, removing the iron plug from the tee and inserting the feed line into the house piping. On the other side of the bag, another small hole was for entry of the feed line.

From the bag, a 4-ft length of ½-in. rubber hose connected to the outlet of a house-type pressure regulator, which reduced the pressure of the alternate supply from 20 psig to 9 in. wc. The regulator was mounted on a small platform which also had a shut-off valve ahead of the regulator to control the gas supply to the bag and a 12-in. manometer connected downstream of the regulator to indicate the pressure being served.

From the inlet of the regulator, a 100-ft high pressure welding hose was connected to the alternate supply, a standard ICC oxygen cylinder containing natural gas at 2000 psig. The pressure of the gas in the cylinder was reduced by a Victor two-stage regulator to 20 psig before entering the welding hose.

Although the first device was crude by today's standards, it proved to be a practical and dependable procedure for changing meters. It not only solved the "not home" problem but also required less time, indicating that some really worthwhile savings could be realized if it was used to its fullest potential. Therefore, after the war, we decided to go all out with it.

This led to the establishment of standard meter-set designs and to improvements in the device, itself. Meter set designs up to that time varied considerably among our eight operating divisions. This was due primarily to the fact that the SoCounties system had developed through the acquisition of various small companies, each with its own way of building meter sets. Two or three of the eight divisions were fairly ready to use the device because most of their meter sets included an outlet tee. However, in some divisions, many of the older sets did not have the tee, and in one, none of the sets had it.

Such conditions prevented full use of the device immediately. But, we knew this problem could be overcome in 10 years—by installing tees on all changes and including them in all new sets. This was done, and today the device can be used for practically any meter change under the 30 light size throughout the 770,000 meters of the SoCounties system.

The decision to make full use of the hot change device also led to three improvements in it:

1. The innertube was replaced with a molded rubber bag fitted with a backing plate. This did three things: (a) reduced the size and awkwardness of the bag; (b) allowed the feed line to be manipulated in and out of the houseline (without putting the hand in the bag) via a sliding arrangement through the backing plate; and (c) allowed the iron plug in the tee to be removed and replaced by manipulation from the outside.
2. A reel was designed for the hose. Originally it was just looped and carried loosely in the bed of the trucks.
3. A purge valve was added to the bag assembly. It serves three purposes: (a) bleeding air from the bag and the new meter; (b) taking the pressure of the service regulator; and (c) feeding through the bag where bullheaded tees were encountered.

Since the device went into company-wide usage, three other changes have been made to further improve it and reduce its cost. They are:

1. The hollowed-out rubber expansion plug was replaced by a tapered rubber probe. The probe is held in place in the houseline by friction. We experimented with various materials, including plastic, and finally selected neoprene rubber as the best. Experience has since shown that the probe is both faster to use and much more durable than the expansion plug.
2. The platform was replaced with a Lyons tool tray. At the same time, the house-type regulator was replaced with a smaller Fisher regulator and the 12-in. manometer by a small spring gauge. Both are mounted on the tray handle. This is not only a lighter and more compact arrangement, but it provides a means of carrying tools and fittings.
3. The ½-in. rubber hose between the regulator and the rubber bag gave way to lightweight plastic surgical tubing with an internal spring to prevent kinking.

The procedures followed in using the present device are relatively simple, as shown by photographs on

the following two pages illustrating the major steps.

When the serviceman arrives on the premises, he first checks the meter set to make sure the device can be used. The one requirement is an accessible plugged tee. After the preliminary survey, the serviceman returns to the truck, where he opens the cylinder valve and checks the high pressure regulator to be sure it is set to approximately 20 psi. He then unlocks the hose reel, picks up the tool tray and bag assembly with one hand and a meter with the other, and starts for the meter set. The hose unwinds from the reel as he walks along.

At the meter set, the first step is to loosen the iron plug in the outlet tee until it is only hand tight. Next, the bag is fitted over the outlet tee, the valve at the tool tray assembly is turned on, and air is bled from the bag through the purge valve. After checking the feed pressure, which should be 9 in. wc (measured on the gauge on the tool tray), he removes the iron plug in the tee by twisting it from outside the bag, then lets it drop into the bottom of the bag. Gas is now being served through the tee from both the service line and the alternate supply.

The next step is to insert the probe through the tee into the houseline. Now, the house is being served only from the alternate supply.

At this point—before turning off the service cock—the operation of the service regulator can be checked by connecting a gauge to the purge valve. After making the pressure test, the line supply to the meter assembly is turned off and the meter—and service regulator, if necessary—can be changed.

After the meter has been changed, the service cock is turned on again and the air is bled from the new meter through the purge valve. The probe is then removed from the houseline, the iron plug replaced in the tee, and the bag removed. The job is completed by soap testing and painting the set.

During the early experiments with the device a number of test runs were conducted to test its capacity and reliability. Under various loads up to 225 cfh and houseline pressures as low as 4 in. wc, no appreciable change in the operation of appliances was noted, no pilots were extinguished, and no safety valves closed.

Because it was pioneering, SoCounties could not simply go out and buy the hot change device, but had to manufacture and assemble it from whatever components it could find. The biggest problem was the rubber bag. After the original vulcanized innertube—when it was decided to make the hot change a standard procedure—the company had a special mold made so a rubber company could form the rubber bag to the most efficient configuration.

By now, of course, we have refined the device to a high degree. Here is the complete list of components the company now uses to assemble the hot change device and attendant equipment:

Tray Assembly

Lyon tool tray	$3.34
½-in. Fisher-type 922 regulator	8.00
0 in. to 15 in. wc Marshalltown #83 gauge	8.46
½-in x Cl nipple	.04
¼-in. x Cl nipple	.03
½-in. cross	.43
½-in. plug	.04
½-in. x ¼-in. bushings	.21
¼-in. 450 st. ell	.13
¼-in. lever arm cock	1.33
¼-in. oxygen hose bushing—No. 803-0006	.31
	$22.32

Hose Assembly

Two ½-in. hose x ½-in. IPS hose nipples	1.35
4 ft of ½-in. ID x 3/32 in.-wall koroseal tubing	.72
Two 3-in. x 7/16-in. OD 18 gauge .047 open-pattern springs	.64
	$2.71

Bayonet Assembly

8 in. of ⅜-in. ID x 1-in. OD 80 Shore rubber stock	3.75
½-in. hose x ½-in. female IPS #1696 Schrader coupling	1.06
	$4.81

Bag Assembly

Two rubber bags	3.50
¼-in. Crane #700 air cock	1.02
Two #34 brass washers	.15
¼-in. IPS brass lock nut	.15
½-in. lock washer	.01
	$4.83

Truck Assembly

Hose reel	22.00
100 ft of 3/16-in. hose	13.50
10 ft of ¼-in. hose (tank to reel)	3.50
Victor two-stage regulator	49.00
Gas cylinder rack	15.30
110-cf gas cylinder	35.00
(or 220-cf gas cylinder)	(52.00)
	$138.30
	($155.30)

Total cost of the device and attendant equipment is $172.97 or $189.97, depending on whether a larger or smaller cylinder is used. Operating cost of the cylinder is figured at $1.33 each, for handling and filling, plus 32 cents for transportation.

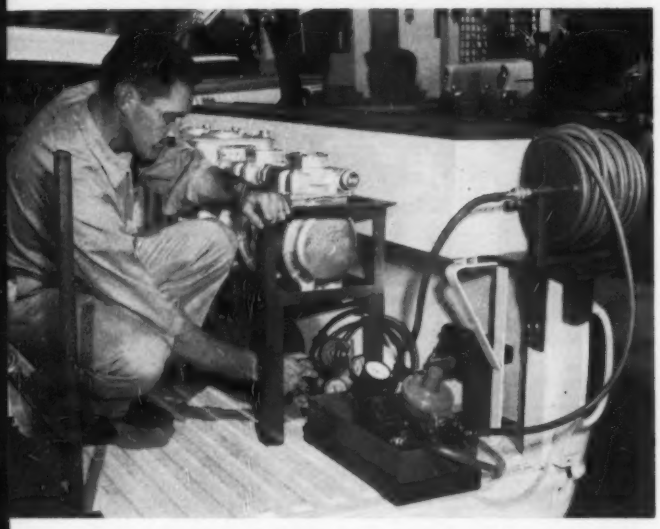
As this story is being written, the company is negotiating with a private manufacturer to take over production and sale of the hot change device. It should only be a matter of time, therefore, before it is on the market and available to any distribution company.

Among the companies who have already started to use the device are Southern California Gas Co., with its 1.7 million meters, and Pacific Gas & Electric Co., with its 1.65 million meters.

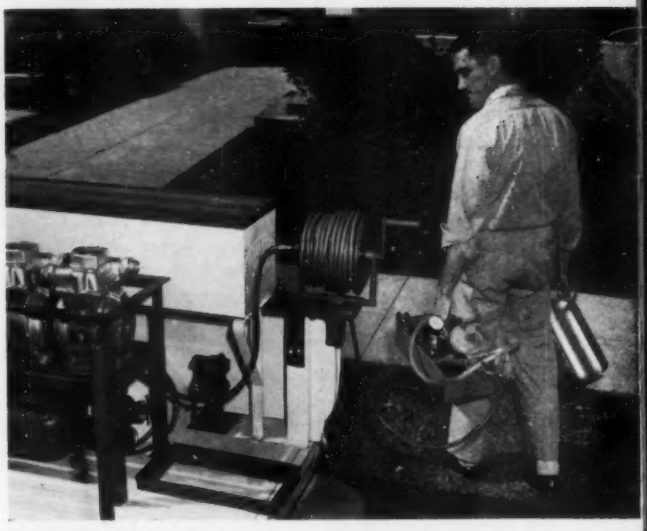
As for our own company, we can, as earlier stated, now change more than 90 per cent of our 770,000 meters with the device. We have used it for 16 years and find that it becomes more and more valuable. Our construction and distribution crews, for example, now make use of it to avoid customer inconvenience.

Succeeding articles in this periodic-meter-changing series will tell how SoCounties has modified trucks for PMC work and how we schedule this work. ■

HOT METER CHANGE ACCOMPLISHED IN 8 STEPS



1 The serviceman turns on the valve to the alternate gas supply, a standard ICC oxygen cylinder containing natural gas at 2000 psi.



2 With the meter in one hand and the tool tray containing the bag and feed assembly in the other, the serviceman starts toward the set.

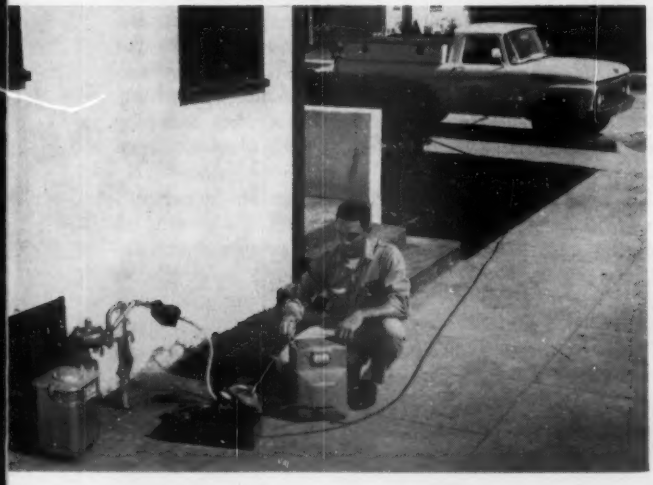
5 The plug has been removed (temporarily giving the house two sources of gas) and the probe is inserted into the houseline, putting the house only on the alternate supply.

6 This close-up shows that 9 in. of pressure is being served through the device. The service regulator can also be checked at this point.

3 At the meter he loosens the iron plug in the outlet tee until it is only hand tight. Later he removes the plug while the bag is over the tee.

4 With the bag now on the tee and the alternate gas supply turned on at the tray, the air is bled from the device through its purge valve.

7 The old meter—and, if necessary, the old regulator—are then removed; but service continues uninterrupted, whether or not "anyone is home."



8 The new meter is installed and purged of air. To complete the job, the plug is replaced in the tee, and the device is removed.

automation in gas industry operations

PART II of a series resulting from a field study in depth made for GAS Magazine by an authority on the subject.

By KEN KRIDNER • Engineering Editor

THIS is the second in a series of articles dealing with the current state of the art of automation in the gas distribution and transmission operations. In this article we will begin with the integrated, but basically distribution, companies operating on the West Coast and will deal with concepts inducive to improved systems.

Advance in the field of automation by gas distribution companies has been the result of careful evaluation of benefits to be derived. Personnel from distribution companies are among the first to point out that systems are automated as the result of a careful economic evaluation and not for the glory of having an automated facility.

Thus, when we speak of automating the activities of a gas distribution company, we should recognize the state of development that the art has achieved within the sphere of operation of the company. The adoption of the philosophy of automation follows the acceptance sequence below in its usual inclusion in company operations:

1. Telemetering of flow and pressure data.
2. Remote instruction for actuation of valve operators.
3. Remote starting and operation of gas compressors.
4. Automatic logging of data in a central office.
5. Use of high speed computers for computation of on-line data.
6. Issuance of feed-back instructions.

It may be seen that a large number of gas distribution companies, large and small, are now partially automated. That is, they utilize automatic equipment for the above purposes to varying degrees. The use of telemetering equipment is quite prevalent in the distribution side of the industry for bringing in distant values to a dispatching center. Current efforts of a few companies are to utilize high speed electronic computers for: (1) logging incoming data, (2) for guarding set-point high and low limits, (3) for signalling alarms in the event of an off-control condition, and (4) for summarizing data into a form whereby it may be utilized by dispatchers with a minimum of manual handling.

It remains to be seen whether high speed computers will be utilized in a closed circuit wherein incoming data will be scanned and evaluated, and instructions for corrective action fed-back to the source point. There remains also the possibility that the computers will be used for optimizing, controlling in part, the economic structure of the company through evaluation of all contingencies in selection of source gas as an on-line function, considering therm content, price and contract commitments, etc. Results thereby obtained would be used by the dispatchers to permit a decision based on current, complete factual information. Moves in this direction of utilizing computing equipment for logging and data evaluation have been made by Public Service Co. of Colorado (Denver) and by Northern Illinois Gas Co., Bellwood, Ill.

However, in the more immediate future is the need for a procedure that can be used to evaluate existing and proposed distribution systems to eliminate the

long and tedious calculations being used to resolve network losses and to determine required system modifications. Although this problem has been resolved by some of the larger companies, the majority of the smaller distribution companies have not acted on it. This problem has been resolved in part by utilization of an electrical analogue device called the McIlroy Fluid Network Analyzer, used to simulate steady state conditions in a distribution piping network. This equipment is not new, having been used for a number of years in resolving problems in water systems; however, in recent years, the application of the Fluid Network Analyzer to problems related to gas distribution has resulted in the acquisition and use of analogue-type computers by several companies. The largest unit was purchased by Southern California Gas Co. and is now installed in its offices in Los Angeles.

Results achieved from use of this type unit may well justify its use by smaller companies in the evaluation of their systems. It is my belief that the results that can be obtained warrant a discussion of the computer and its operations in this series.

Design of the analyzer is based on the law which requires that the sum of gas flows approaching a piping junction must equal the sum of the flows leaving the same point; and, the sum of friction pressure drops if taken clockwise around any gas piping loop will equal the sum of the friction pressure drops taken counterclockwise around the same loop. An analogy may be drawn between flow characteristics in a gas system and an electrical circuit; that is, the current through a resistor will represent gas flow, the voltage drop across the resistor will represent pressure drop or line loss, and the resistor is used to represent characteristics of a pipeline section. This analogy is predicated on the current through the resistor and the voltage drop across the resistor being similar to the relation between flow through a pipeline section and the pressure drop between its terminals. If this relation can be maintained for each pipeline section in a network, then a set of suitable resistors, properly interconnected according to a map of the distribution network, can be employed to represent a gas distribution system because an electric circuit simulates obedience of the general laws which govern the operation of a pipeline network.

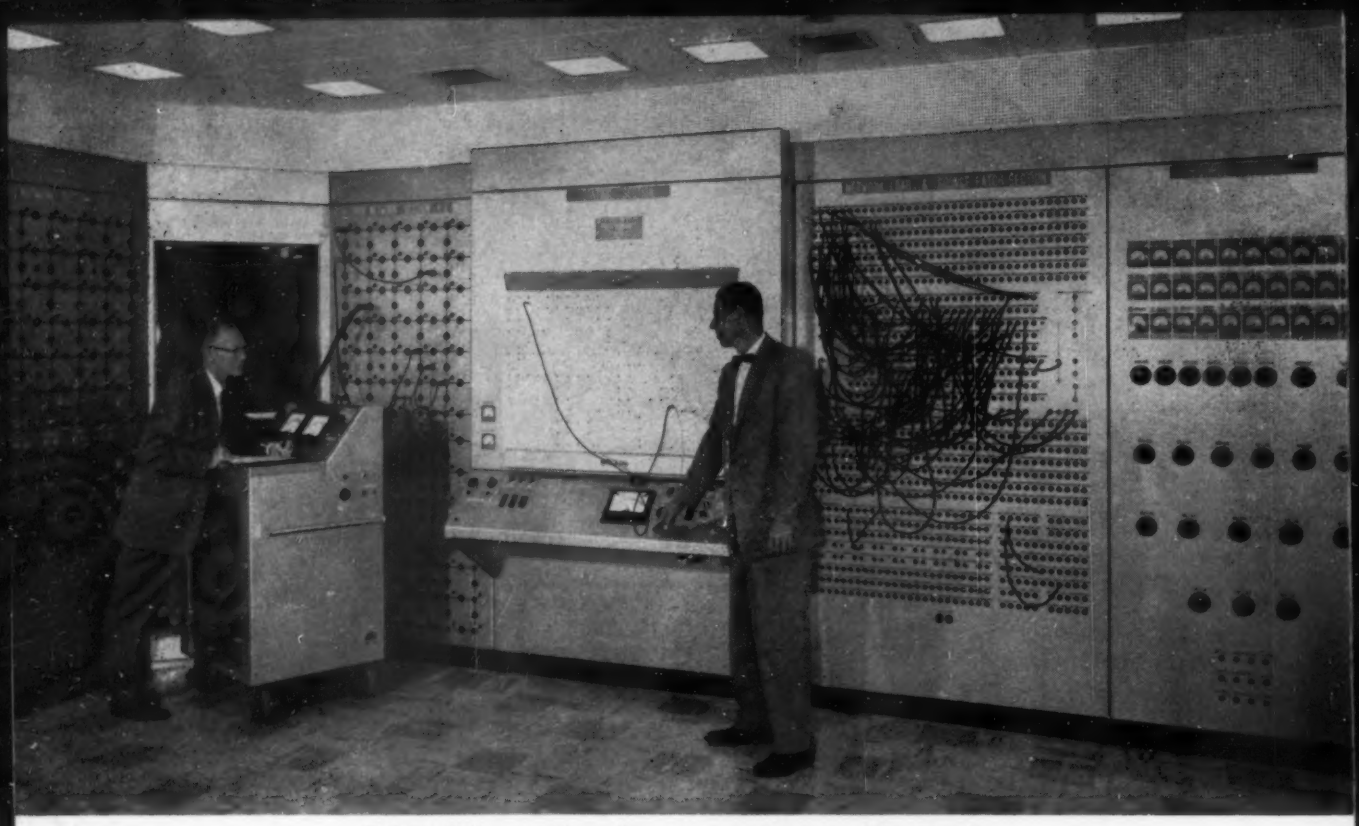
By use of electrical components to represent the characteristics found in a network of piping, we can reproduce the known conditions in the system as taken from data available from measuring devices. The results obtained through application of the analyzer permit a rapid evaluation reflecting the flow in each network segment and the direction of flow for any number of proposed revisions to the network.

The ease of changing connections and freedom from computational drudgery are assets to the electrical analogy method of solving the physical problem. The use of a resistor having non-linear properties wherein the voltage drop across the resistor will vary as the 1.85 power of the current through the resistor is well adapted to the representation of the performance of mains and pipelines. The analyzer consists of four basic components—sources, loads, pipeline sections, and the instrument panel.

The unit purchased by SoCal has a total of 225 loads, 36 sources and 710 pipe sections. The analyzer is under the direction of the engineering department and under the supervision of John Morris, staff engineer, and C. O. Lewis, administrative aid. Since acquisition and installation in September 1956, SoCal has entered into a five-year program under which the 13 divisions of the company will have evaluated over 14,800 miles of distribution system and 1744 miles of transmission system. Lewis advised that they had experienced a utilization of 225 work days per year out of a maximum availability of 242 work days. The unit is normally down two weeks each year for general maintenance.

As Lewis stated, "The analyzer is a tool to help the division personnel get what they want out of their systems." Southern California has the services of Lewis to supervise operation of the analyzer, but has placed responsibility for resolving problems with division personnel. Now, over 17 SoCal people are qualified in the operation of the computer. This practice permits personnel most familiar with the on-site distribution facilities to resolve their problems, possibly accomplishing not only a better solution of the prob-

SoCal's standby compressor at Gaviota. The unit, on signal, automatically speeds up and loads itself to meet demand conditions.



SoCal's fluid network analyzer is supervised by John Morris (right), staff engineer, and C. O. Lewis (left), administrative aid.

lem, but also pride on the part of personnel in the end-result. After all, as Morris so aptly put it—"the intent is to achieve a betterment program based on analyzer results."

For an indication of time required to resolve a problem on the analyzer, Lewis stated that a system composed of 160 elements (that is, a combination of loads, sources and pipeline sections) would require 64 manhours from start of assembly of raw data in the field to wiring the problem into the board. An additional 16 manhours would be necessary to take the required readings on the board. A digital voltmeter is used for taking readings, improving the reproducibility of results.

Utilization of its analyzer has permitted Southern California Gas Co. to improve performance of its distribution system and to more economically schedule new construction to obtain the maximum of efficiency and throughput for investment output.

Computers of the type used by SoCal are available to distribution companies through the facilities of organizations that lease use-time for resolving problems related to network analysis. Through use of this type of equipment a gas company can assure itself of the best designed distribution system having a minimum of pressure drop.

It would be improper not to mention at this point that there are programs written for use with electronic digital computers that will resolve the various flow formulas mathematically to achieve the same result that is accomplished by the McIlroy Analyzer in an analogue fashion. We will cover the procedures used in the mathematical resolution in our discussion of other companies' operations. Digital-machinery resolution of the problem is applicable to both distribution and transmission operations.

Another problem that has been resolved by one of the companies operating in the Los Angeles area is that of maintaining a desired design capacity volume in a pipeline section by use of a self-contained compressor unit. This unit is indicative of operations that may be automated to the advantage of a distribution company.

Southern Counties Gas Co. utilizes this standby compressor at its Gaviota station. The unit, on signal, automatically speeds up and loads itself to meet the demand condition. The unit, a 660-hp Ingersoll-Rand 12 SVG-1 unit, is designed to maintain desired flow condition with a discharge pressure of 400 psig on the system between the Goleta storage field, near Santa Barbara, and Santa Maria, Calif. Since this has been an isolated section of delivery lateral, that is, located where it has not been practical to supply gas from other laterals, it is necessary that the available supply be held at a maximum at all times.

The compressor is placed in operation and left on the line in an idling condition by personnel who periodically check for corrective or preventive maintenance required. The unit is blocked off the line with the by-pass valve around the station open. The machinery

uses four principal controllers—(1) a Foxboro T/37 flow controller, (2) a Foxboro auto-selector controller, (3) a Foxboro differential controller and (4) a Foxboro pressure indicator. The flow controller must emit a 17-psig output before the compressor will pump gas. A signal from the flow controller will initiate closing the by-pass valve around the station, opening the intake valve and a signal to the auto-selector to speed up the compressor and begin cylinder step-loading.

The auto-selector controller operates from suction and discharge pressure. Its primary action is to accomplish packing the discharge side of the transmission line to a maximum of 400 psig, while not permitting pressure on the suction side to drop below 260 psig. The output signal from the auto-selector is transmitted to the engine speed governor and to the clearance pocket operator.

The output signal will vary from 3 to 15 psig; however, up to an output signal of 8.5 psig, the signal will increase speed with no loading. From 8.5 to 13 psig, the speed governor will continue to control the speed but, in addition, cylinders will be loaded at 0.5 psig intervals. Cylinders will continue to be loaded as demand increases. The compressor will operate between 300 and 400 rpm and with enough cylinders loaded to maintain a constant 400-psig discharge.

The differential controller measures differential pressure across the compressor station and has been set to 5 psig. The action of the controller is to maintain the by-pass valve in a closed position until the differential on the controller has reached 5 psig, at which time the by-pass valve will be opened. The compressor will continue to operate at an idle speed.

The controller utilized for protection purposes is a Foxboro pressure indicator with low alarm tied into the lubricating oil pressure circuit and set for 25 psig. In the event of a compressor shutdown for any reason, this instrument will telemeter a signal to the Santa Barbara office which will turn on an indicator lamp and sound a horn.

In the event of an instrument gas failure, adequate safety devices have been built into the circuit to protect the compressor, and, in addition, to send an indication to the Santa Barbara office.

This type of unit is ideal for use by distribution companies where small amounts of horsepower are required for intermittent injection of gas into storage reservoirs, for maintaining line pack, or for gas-mix operations.

Although the Gaviota station of Southern Counties Gas Co. is designed for automatic unattended operations for a preset output condition, if the operating company had the need and desire, this unit could easily be adapted to full automation utilizing a sequential start-stop engine panel and a remote set-point initiated from the dispatching office. The need for the local or remote set point instruction is determined by the conditions presented and the economics involved. However, in view of existing telemetering circuits being used to bring in information data from the station, these same circuits by modifications could be used to send instructions for set-point to the station. The signal from the flow controller would then also go to the start-stop panel to bring the compressor on the line in the idling condition.

Southern California Gas Co. has utilized telemetered data from strategic points throughout the system to its Spence Street and satellite dispatch points for many years. The telemetered data reflects gas pressures for control, and differential and static pressures for flow calculations. These data are then utilized to complete calculations for flow information necessary to the proper handling of gas through the system.

This company also is using a method for checking odorization of gas in its system, using an American Meter Co. integrating orifice meter which is connected to the odorizing unit. The rate of injection of odorant is then fed to a satellite control point where the data are recorded and instructions initiated to personnel to insure proper levels of odorant.

Pacific Lighting Gas Supply Co. uses American and Bristol telemetering systems for dispatching reset signal to remote regulator stations and for bringing data from distant points to the dispatch center. PLGS also initiates signals from the center to remotely control operation of valves at a key city gate delivery point.

SoCounties operates a pipeline from Blythe, Calif., to Los Angeles, bringing Texas gas into California. On this line are two General Electric turbine-powered centrifugal compressor stations located at Cactus City (a 6200-hp unit) and at Desert Center (a 5700-hp unit). These stations could be adapted to automatic unattended operation by adding communications equipment whereby a signal from a distant point could actuate the units. However, they are currently operated by a one-man crew on an around-the-clock basis, the operator receiving instructions from the Blythe station and manually making necessary adjustments, though manual operation for starting or stopping a unit consists simply of pushing a button. Full discussion of operation of the turbine units will be included under discussion covered in a later part of this series.

Southern California Gas Co. has established a group to review the general pattern of development of automation and has determined the sequence of study. Included in this is the study of application of automation to dispatching. This procedure for approaching use of automation has been adopted by many companies and may well be the most meritorious method of evaluating from economic standards and advantages to be gained from utilization of automated facilities.

In the activities of the three companies discussed, there has been a limited, selective entry into the automation field. Although all have utilized telemetering and remote set-point, there has been no effort to date to integrate this information through utilization of computing equipment. It will be found as we continue in next month's issue, that Public Service Co. of Colorado and Northern Illinois Gas Co. have contemplated and are even now entering this phase. In addition we will look into the activities of Public Service Electric and Gas Co. of New Jersey.

Hence, next month we will swing to the Rocky Mountain region of Denver; to the windy city of Bellwood, Ill., and on to the East Coast area of Newark, N. J., as we continue our discussion of automation and improved devices for distribution companies.

Mobile leak detection unit

R. W. McDonald, geologist and driver of the mobile leakage unit, lowers one of the two snorkels to within a few inches of the pavement (top photo). At left, McDonald carries a portable leak detector away from the vehicle. He reports his findings to the mobile unit via two-way portable radio. Oklahoma Natural's Loyd Goodson (left) and Tulsa's assistant distribution superintendent, Kenneth Knouse, take a look at a roll of graph paper from a multi-block run (above photo).

LONG snouts hung over front fenders of the bright red and white Jeep as Tulsa motorists and pedestrians watched it creep along their streets. Almost touching the pavement, the snorkels looked like vacuum cleaners.

But the Rayflex mobile unit was not sweeping streets. It was sniffing—with a nose for methane. Its infra-red detector can smell as little as three parts gas out of every million parts air.

Oklahoma Natural Gas Co., which has contracted with Rayflex Inc. of Dallas to test the unit, has found that the mechanical sniffer is doing the same work it would take 63 men to accomplish. The mobile unit needs only two. Moreover, while hunting leaks, the Rayflex vehicle bores no holes in paving. Its twin snouts, held close to the ground, do the job.

A seismic operator in the back seat rides in a nest of instruments. Before he begins his run, he calibrates them using methane that will produce a known reading. Next he writes something like this at the beginning of a roll of graph paper: "South from inside 11th street on Galveston avenue. Survey west side of street. Wind velocity 3 to 5 mph. Wind direction N.E."

As the vehicle moves along, the operator studies the graph, watching for any blips made by the mechanical hand as it travels its course. When the infra-red filter detects a leak, the instrument draws a blip line showing the spot of the leak and about how much gas is escaping. The operator jots down such information as street numbers or road signs to identify his location.

Afterwards, Oklahoma Natural leakage crews, even with a minimum of training, can look at these graphs and know where to make repairs. In the first place, the graph will locate the leak within a radius of 5 to 6 ft. Second, according to the size of the blip mark, the crew foreman decides the priority of the leak. He'll fix the worst leaks first.

As one of the first utility companies to put the Rayflex operation through extensive tests, Oklahoma Natural has already used it to cover about 160 miles along business area streets in Tulsa. Because it can make 15 to 20 miles a day, it doesn't take long to get this coverage. Its next experiment is along ONG mains in Oklahoma City.

To Loyd Goodson, Oklahoma Natural engineer, the mobile operation promises greater safety. "With it we could cover a city five times where we now are covering it once with conventional leakage crews," he observes.

"Besides, it would contribute handsome savings to our leakage operations," he points out. "This would give us more manpower for maintenance; our crews would have more time to make repairs."

One of the chief advantages of a successful mobile operation would be its public relations value, Goodson declares. "The city doesn't like us to bore holes in the pavement," he says.

Seismic operator Jim Giles keeps his eye on graph which will automatically pick up methane leaks.

Using the mobile unit, ONG avoids this annoyance. The vehicle moves along the stream of traffic getting in few people's way.

In its testing in Tulsa, the unit was largely put to work at night when street traffic was lowest.

Oklahoma Natural crews have been following the mobile unit with conventional leakage tools to see if they can find any leaks the mobile unit misses. So far, they haven't.

"In tests, so far, the unit can determine with surprising accuracy the location and size of a leak," Goodson says. Conventional leakage crews are able to find fewer leaks since they bore only every 50 ft. The mobile unit, of course, gets consistent readings as it moves down the street.

The Rayflex operators have a small portable leak detector which a man can carry away from the street to buildings and other points. Portable two-way radios are used between the operator of the portable equipment and the seismic operator inside the vehicle.

Rayflex, which designed the mobile unit and furnishes its two operators, has constructed about seven others and has plans for 10 more. According to Jim Giles, seismic operator assigned to the Oklahoma utility, Rayflex is busy showing its operation to various utility firms.

Rayflex, in addition to its design and engineering of the mobile leakage unit, specializes in land and offshore exploration for oil and gas. It operates worldwide.

Oklahoma Natural engineers point to their experiments with the mobile equipment as an effort to promote greater safety and economy.

"The gas industry must always find new and better ways of getting the job done," Goodson says. "I think we should help set that pace." ■

This series of articles by Irving Deutsch is designed to present the important technical, economic and practical properties, laws, and practices of the gas industry in a terse, concise manner for those seeking a fast overall picture, those seeking a basic understanding of the industry, and those in the industry desiring a review.

Production Transmission Distribution Utilization

Part 1. Introduction

IT is difficult to know just when to write a preface; that is, before you actually start to write the text or after. I believe it is better to write it before the actual text is written because it then gives a more accurate picture of the motivation behind it all.

Much of the material was developed because of the need to solve problems in the production, transmission, distribution, and utilization of gas brought about by the unprecedented growth of the industry during and after World War II. The first phase was the simultaneous construction of large diameter high pressure gas transmission lines from the sources of natural gas in the Southwest, for the most part, to the West, Midwest, and Northeast, and the over-capacity loading of existing gas production facilities during the war. The second phase came after the war when natural gas was diverted from the war effort to domestic use, bringing the gas industry into a favorable competitive position with other energy sources.

The over-capacity operation of production equipment provided valuable data to base the design of peak-shaving high-Btu oil-gas equipment, for example, to properly handle high air, steam, and oil rates, to modify equipment to reduce carbonization and deterioration of fire brick, and to develop new automatic hydraulic, electric and electronic control devices. Experience was gained in the use of interchangeable gases such as liquid petroleum gas together with the experience of handling LPG equipment destined to become more important with ever increasing house heating loads. Catalytic reform processes used initially to convert natural gas to an interchangeable low Btu gas provided the gas industry with a new tool.

The conversion of low Btu manufactured gas systems literally doubled the capacity of existing transmission and distribution systems, but new problems were created that demanded everything from stopgap measures to long-term research. Some of the problems were: dust due to the relatively dry natural gas, internal corrosion, odorization, leak detection, unaccounted for gas, new interchangeability problems, natural gas contracts and their relation to the peak shaving problem (or to put it another way, how much natural gas should a gas company purchase), and many other problems.

Despite the existence and availability of comprehensive texts and reference material, there was still the need for a work that would extract from the available sources that information necessary to give technically competent people an overall picture of the

gas industry. Starting with the historic development of the gas industry, for the purpose of romance and to develop some technical foundation, there will be a discussion of the production, transmission, distribution and utilization of gas intended to develop the important basic laws of physics and chemistry and engineering that dictate the economic design and operation of an efficient gas system. Every effort will be made to introduce the new technical developments in the design and research stage that may affect the future of the gas industry. No details of construction or design will be given if the information is readily available from existing sources or from the manufacturers' literature. Rather, emphasis will be placed on design principle to afford maximum understanding and retention of information. There will be an effort made to deepen insight and to relate the material to common experience in order to remove the air of mystery that sometimes envelopes a subject during the learning process.

The material is directed to those with long experience in the gas industry desiring the basic relations mentioned above, and to those with advanced technical background who desire a foot-in-the-door leading to the application of basic laws to render useful results. Where possible and necessary a new wrinkle or twist will be introduced to foster better understanding.

It is normal practice to include the acknowledgments in the preface. Since, however, this preface is being written in advance of the preparation of the formal text, there will be no formal acknowledgment at this time. On the other hand, since the material is based on material developed in the presentation of a course called "Gas Production, Transmission, Distribution, and Utilization in the Long Island Lighting Co.," I want to thank those in the training section who made it possible for me to give the course, and I want to thank the students of both the basic course and the advanced course who patiently sat through 15 two-hour sessions and stimulated my graymatter to explain things in such a way so that they could understand them and in so doing actually produce new and greater insight on my part.

It is impossible to write anything without bringing hardship to one's family by way of neglect and a sort of dream-walking; hence, I thank my patient wife, Lois, and my five children in advance.

Irving Deutsch

TWIXT VALLEY AND PEAK

THE gas industry is founded upon the sound economic principle of supply and demand. From its very beginning when William Murdoch—with the vision of Edison 100 years before Edison—worked to create a reliable source of light that was to light the Nineteenth Century, the century that was to lay the scientific foundation for the whirlwind advances of the Twentieth. It was the light of Murdoch, Philippe Lebon, Frederick Winsor, Samuel Clegg, David Melville, Rembrandt Peale, and other men of great vision and courage that provided a cheaper and better method of lighting home and factory. The technological problems that had to be overcome were many, ranging from the procurement of suitable feedstock coal and oil to finding materials capable of withstanding high temperatures over prolonged periods. Fortunately the primary problem was to make good gas, but even then the daily valley and peak problem had to be solved. By applying the basic principle of the gasometer developed by Lavoisier in his effort to distinguish the components of air, they solved their valley and peak problem so well that it still remains as a symbol of the gas industry . . . the water seal holder.

With the development of the electric light, the continually increasing demand for reliable, low cost energy, constant quality energy, meant an increase in the demand for gas. Again the infant gas industry called upon its men of vision to supply the meter needed to determine consumption. John Malam, Samuel Hill, and Samuel Down responded along with others to supply the detailed technology. Bunsen showed how the gas flame could be improved by the addition of primary air. James Sharp demonstrated the revolutionary method of preparing food with a gas flame . . . a reliable, easy-to-ignite gas flame. And back in 1823, Sir Humphrey Davy was looking into the problems of corrosion of mains and cathodic protection.

But in 1840, the first feeble rumble of our present peak and valley problem was heard. John Criswell used natural gas to refine salt. Shortly thereafter,

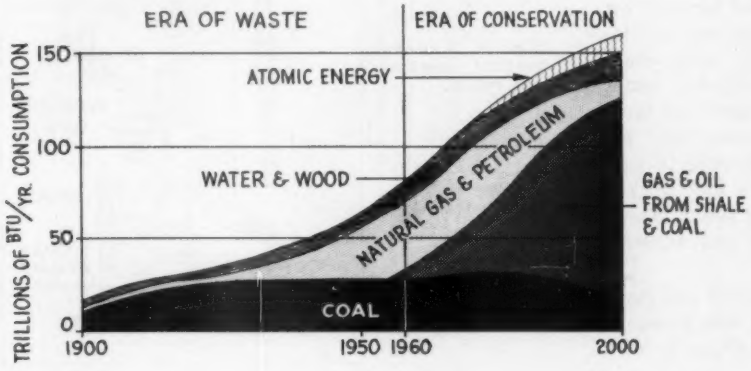


Fig. 1. Relation between time-total consumption-fuel sources.

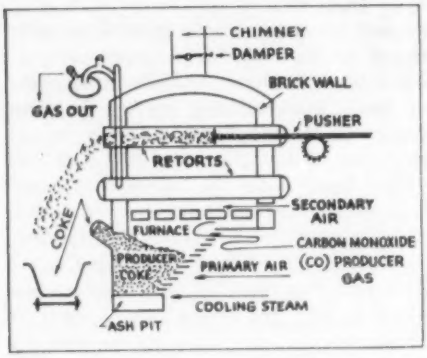


Fig. 2. Early coal retort.

John and Thomas Kirkman patented the first water gas apparatus. Gas lights started to outnumber the oil lamp, and the dry gas meter almost exactly as it is used today made its appearance . . . the dry gas meter that was designed almost from the start as perfect as the needle or the pin. Emerson McMillian invented iron-oxide for taking the smell out of manufactured gas, the smell we are now trying so hard to put into natural gas. While the regulator was pointing the way to controlling high pressure gas, and the electric light was invented by Thomas A. Edison in 1878, natural gas was taking on new and greater importance, but still insignificant as compared to water gas.

From the end of the fabulous, thrilling Nineteenth century—with its cowboys and covered wagons and iron horses and new understanding of the world—to about midway into the dazzling Twentieth century, the distance between the valley and the peak increased . . . but slowly. It meant only an easy summer, a hustling fall, getting ready for the backbreaking winter—the 16-hour shifts. Keep the bunkers full, the holder up, the gas set clean, the drips pumped, the steam pressure up, the hydraulic system operating, the oxide boxes from fouling up, the pressure in the distribution main, the Btu constant . . . keep the men awake. It was really hard work, dirty work, but from it came one of the most dynamic fraternities ever developed . . . the "gasman."

World War II only aggravated the job of the gasman, but he just added two more hours to the 16, and gladly, as his part of the war effort. But now, in the life and death struggle that was going on for freedom versus slavery, capital investment cost of moving precious energy of flare gas used to heat already hot Texas nights was considered. Pipelines in ever greater size and number were constructed with better steel, and better welds, and bigger trenchers, and better pipe wrapping. When natural gas no longer had to be used in such great quantities to produce steel for battleships, guns and bombs, it was diverted to help the now almost exhausted gasmen who had worked through the war without benefit of new blood. There was no draft exemption to speak of in the gas industry. It came as a blessing for all.

New homes could now have their gas heat and clean water heaters. Not too much thought was given to the peak because gas plants were still there to help out, especially when natural gas was reformed to the 540-Btu water gas standard. As loads increased, mains became more inadequate, so inadequate that conversion to 1000-Btu plus was a necessity permitting a doubling of energy-carrying capacity. The $H/\sqrt{d}$ value went from about 600 to 1250.

Gas was in a new competitive position. This new, clean, constant quality natural gas meant lower costs of operation and permitted many companies to make an equitable profit for the first time in years. It caught many by surprise, but it was too good to be true. The challenge of the ever increasing winter peak and summer valley, and the complex demand-commodity structure of natural gas now posed new problems to the gasman. Could the gasman meet this new challenge that called for planning 10 and 20 years ahead? Well, if planning the heating oil, fuel oil, coal, water and manpower requirements of the old water gas plant was not more difficult it certainly was good practice. The gasman analyzed the entire problem calling in the best technology possible and applied the technology to the best data that could be accumulated. The first thing that must be answered is, "Where are we going from an overall energy demand point of view?"

THE OVERALL ENERGY PICTURE

The 1960's will be significant years in the overall energy picture. The reserves of natural gas are at or near their peak while the total energy consumption is increasing at a more rapid rate. Best estimates are that atomic energy will take up only a small part of the energy load, and water power will increase only a small amount with respect to the total increase in demand. In the foreseeable future, say to the year 2000, only 40 years hence, it appears that fossil fuels will remain the primary energy source. *Fig. 1* shows

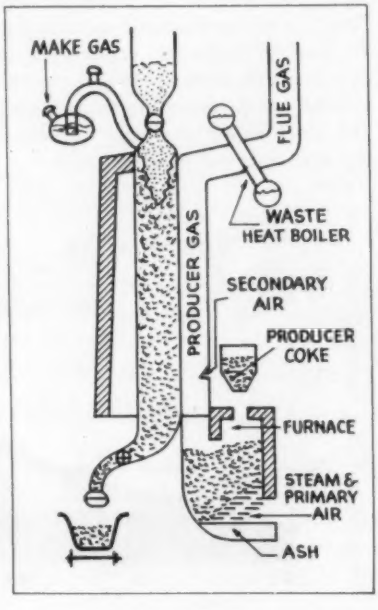


Fig. 3. Modern vertical continuous retort.

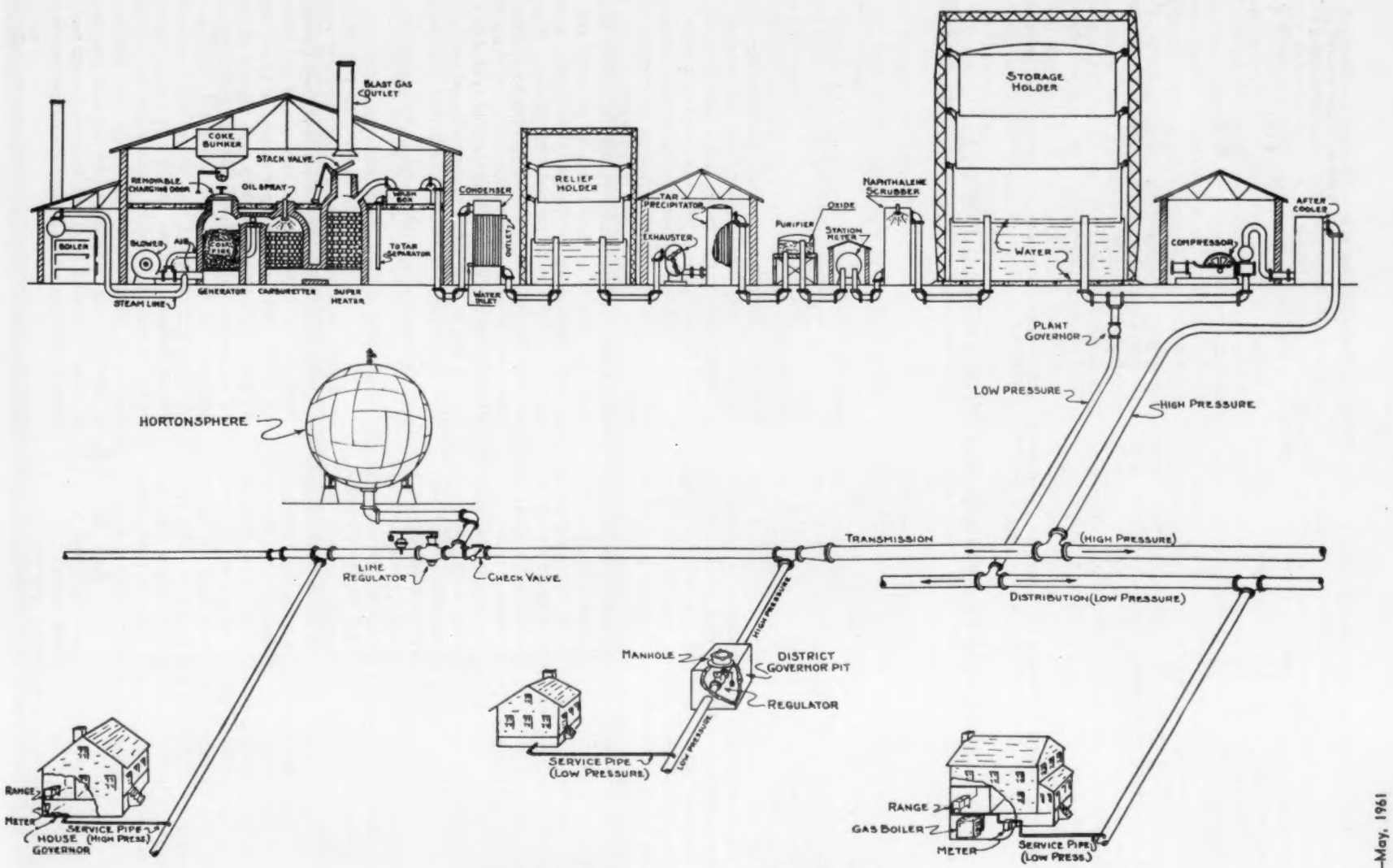


Fig. 4. Simplified water gas set and flow diagram.

the relation between time-total consumption-fuel sources.

The gas industry is already faced with the problem of economically making gas from petroleum, coal, oil shale, and possibly atomic energy. The challenge is recognized and efforts are being made by private industry and government agencies to come up with a solution before the energy demand exceeds supply, especially in the case of gas. The basic problem is one of economics; namely, can the cost of converting residual oil by-products and coal be reduced to the point of making gaseous energy competitive with the direct use of petroleum and coal. Total gasification was successfully achieved in years gone by in two steps. A brief look at the total gasification of coal and oil will be justified now to develop a technical foundation and for historic interest.

GAS FROM COAL AND COKE

Analogous to waste of natural gas in the early days of the petroleum industry, early days of the production of coke from coal were accompanied by the waste of gaseous products when beehive furnaces were used. It didn't take long, however, to realize that the new lighting industry and production of coke had to go hand in hand for economies sake. The growing demand for gas produced an overabundance of coke that soon became a problem. The solution was, of course, to use the coke to make water gas, thereby accomplishing total gasification of coal with the exception of unsaturated by-products—ammoniam, tar, etc.

A schematic of an early coal retort is shown in *Fig. 2*. The horizontal retort is actually a development of the beehive coke retorts—the first type. A portion of the coke produced was used to heat coal to produce the gaseous product and more coke. The reactions that took place were:

C plus O_2 yields CO_2 plus 170,000 Btu

C plus CO_2 yields 2CO minus 75,000 (producer gas)

2C plus O_2 yields 2CO plus 95,000 Btu (producer gas)

2CO plus O_2 yields $2CO_2$ plus 250,000 Btu

C plus H_2O yields CO plus H_2 minus 57,000 Btu (water gas)

C plus $2H_2O$ yields CO_2 plus $2H_2$ minus 38,000 Btu

For every ton of coal, some 14 Mcf of gas was produced together with 1400 lb of coke. Coke retorts of the high temperature type were operated at between 1800 deg F and 2200 deg F, which made it necessary to operate them continuously after startup. Thermal cracking the volatile content of coal produced gaseous products such as methane, ethane, ethylene, and propane in addition to the carbon monoxide and hydrogen which increased the heating value of product gas to roughly between 400 and 600 Btu per cu ft.

A modern vertical continuous retort is shown schematically in *Fig. 3*. Savings in labor and reduction of heat loss are its primary advantages. The continuous retort is the beginning of the development of a modern economical method of total gasification of coal. A more complete heat balance is shown in *Fig. 3*.

An analysis of the final coal gas together with other gases is tabulated in *Table 1*.

A simplified water gas set and flow diagram is shown in *Fig. 4*. (The elaborate treatment necessary accounts for the high cost of water gas and gives a hint of the problems to be encountered in total gasification of coal or oil to produce a high Btu gas.) Since coke is used as the carbon feedstock, there is no volatile product to produce higher heating value components; hence, oil is added in the carburetor as the feedstock to produce thermal decomposition gases. Before the Welsbach mantel, the unsaturated products were necessary to produce the bright luminous flame. Gas consisting of hydrogen and carbon monoxide burns with a blue flame and is therefore called blue gas. Blue gas also has a low heating value. Therefore, the practice of adding oil was continued to keep the heating value at a consistent value of about 550 Btu per cubic foot.

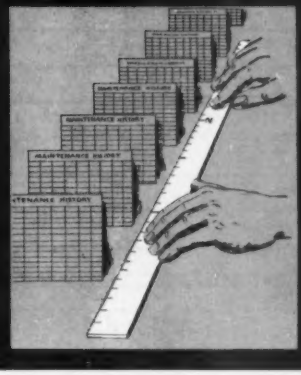
With this brief background we are ready to discuss the component make-up of modern gas and some important properties. ■

TABLE I. TYPICAL ANALYSIS OF GAS IN PER CENT

Components	Natural Gas	Water Gas	Reformed Natural Gas	Sewer or Marsh Gas	Oil Gas	Comm. Propane	Gasoline***	Coal Gas
CO_2	00.7	7.0	03.0	30.0	01.7	—	—	3.0
Illuminants	—	10.0	00.0	—	—	—	—	—
O_2	—	1.0	00.0	00.0	01.7	—	—	0.2
CO	—	26.0	10.0	00.0	00.5	—	—	10.9
H_2	—	28.0	30.0	02.0	13.0	—	—	54.5
CH_4	94.0	12.0	40.0	65.0	38.0	Trace	Trace	24.2
N_2	00.4	16.0	17.0	03.0	18.0	—	—	4.4
C_2H_6	03.5	*	*	—	2.5	3.0	Trace	—
C_2H_4	—	**	00.0	—	17.0	Trace	Trace	—
C_3H_8	00.8	*	*	—	1.5	84.0	0–.1	—
C_3H_6	—	**	00.0	—	3.8	6.0	Trace	—
iC_4	00.15	*	*	—	—	3.0	0–.1	—
nC_4	00.15	*	*	—	—	2.0	0–.1	—
C_4H_8	—	**	00.1	—	2.3	1.0	Trace	—
C_5+	00.3	*	*	—	—	1.0	99%	—
H.V. Btu/ft³	1040	540	540	650	—	2600	—	—

* Included with CH_4.
** Included with Illuminants.
*** Gasoline—C_5 5 to 15%; C_6 20 to 40%; C_7 20–40%; C_8 20–40%.

Fix it or Junk it?



To answer this question about any specific section of leaking main, Northern Illinois Gas Co. developed an economic yardstick. James A. Newkirk, manager of maintenance and special services for NI-Gas' eastern division, gives a blow-by-blow account of how this yardstick is used.

FOR a number of years, Northern Illinois Gas Co. operating personnel felt that our repair and replacement program would not be adequate to properly maintain distribution mains and services in the future. The post-war period had brought rapid growth, both in service area and customers. Providing an adequate force of men and equipment to connect new customers many times meant: shifting manpower from maintenance to new business, making minimum repairs consistent with safety, and repairing when replacement was clearly indicated.

Our first need appeared to be some sort of a yardstick to measure and evaluate then-current practices. We did have two statistical indicators. First, our lost and unaccounted for gas if allocated only to the older mains and services, seemed highly significant. Second, our accounting records indicated that we had not been spending as much on distribution maintenance as many other companies.

It became evident that our auditors, Arthur Andersen & Co., might provide the needed yardstick. Andersen had helped Southern California Gas Co. and Milwaukee Gas Light Co. establish repair and replacement programs. After several conferences, the firm was engaged to work on our general maintenance problems.

Andersen representatives spent considerable time in our operating areas, surveying current practices and records. Additional data on the age of mains and services were obtained from our plant records department. The result was a report, making five recommendations:

1. Realign certain lines of authority and responsibility;
2. Develop a comprehensive leakage survey program;
3. Design more useful leakage and maintenance history records;
4. Make studies to provide essential engineering and cost information;
5. Formulate standard decision-making procedures, including related manuals and forms.

The first recommendation, realignment of certain operating department lines of authority and responsibility, was carried out in 1958. Maintenance sections were established in our three big divisions which serve concentrated areas. These sections are responsible for: scheduling and performing all maintenance work, administering the leakage survey program, and maintaining leakage and maintenance history records. These sections also locate and protect our facilities when work is done by other utilities and contractors anywhere in our operating area. At present, it is not economical to establish maintenance sections in other divisions which have either an insufficient number of men or reporting centers which do not make this type of operation feasible. The realignment enables each section to carry out

LEAK SURVEY — VEGETATION — Town _____ Area _____

N.J.GAS CO. 1-1054 5-58 — of

ATLAS PAGE NO.	19 DAY AND MONTH START AND FINISH		SURVEY BY	19 DAY AND MONTH START AND FINISH		SURVEY BY	COMMENTS (MAN HOURS ----)	BARRING PROVIDED

Fig. 1

its assigned work without depending on other sections for manpower and machinery.

The second recommendation, development of a comprehensive leakage survey program, actually meant supplementing our current program, which was in accordance with Section 8 of ASA B-31.8-1958, "Gas Transmission and Distribution Piping Systems." We added a once-every-five-years bar hole test over all bare pipe and bell-and-spigot cast iron mains. This test is considered most informative of main condition and, therefore, the most helpful in evaluating replacement vs. repair costs. We purchased two drilling machines, LeRoi tractors with Thor wagon drills. These units drill two to three holes a minute through 6-in. concrete. Some 900 miles of pre-1930 cast iron main and 2250 miles of steel main without protective coating are being surveyed at present. At a test frequency of every five years that means 630 miles of main must be surveyed every year with test holes made over each service tap, or every 50 ft.

The third recommendation, design of more useful leakage and maintenance history records, was completed with forms designed to uniformly control all phases of the survey program throughout the company. These forms are used with a supporting manual to develop a leak atlas or historical record of main condition. This record supplies the basic data necessary to make repair vs. replacement analysis. The manual is in five sections: (1) "Leak Survey Records" tells what forms to use and how to use them; (2) "Record of Pipe Condition" tells what information is wanted on the leak atlas and how to record it; (3) "Cost Analysis" gives the information necessary to determine—on a cost basis—the appropriate action to take with a section of leaking main; (4) the "Appendix"; and, (5) the "Forms."

The fourth recommendation, studies to provide essential engineering and cost information, is a continuing project. Internal mains treatment, cathodic protection, bell-joint clamping, etc., must be studied to determine the best way to incorporate such items into cost data.

The fifth recommendation, formulation of standard decision-making procedures, includes the already-mentioned and related forms. A close look at several of the forms will help explain the program.

The Vegetation Card *(Fig. 1)* controls all vegetation surveys in residential and rural areas. Each atlas page (a map of a small section of our distribution system) is recorded in the far right column. This card form is filed by year of the next scheduled survey. Reference to the current year's open cards makes work assignment easy. Also, the following year's work can be determined to prepare budget estimates. When survey men are assigned towns to be inspected, they indicate on this form the day the survey was started. And at the end of each day, they sign and date the cards opposite the atlas page surveyed. At the end of the month, a count of the number of quarter pages surveyed during the month is posted in a monthly activity report. Then, the cards for the surveyed towns are refiled to the year of the next scheduled survey. To avoid duplication of work—having a section of main inspected in two different types of surveys—the column at the right is checked opposite the atlas pages involved in a bar hole survey. Checks are made on this form at the time the control cards are set up for barring. When vegetation survey work is assigned, this form

LEAK SURVEY — BARRING HISTORY RECORD — Atlas Page No. _____

N.J.GAS CO. 1-1055 5-58 — Barring Cycle _____ Town _____

YEAR	DATE BARRING ORDERED	DATE COMPLETED	SURVEY BY	BARRING ORDER NO.	COMMENTS MAN HOURS	RESULTANT ACTION
19						

Fig. 2

is reviewed for checks. If there is a check, the barring control cards are reviewed.

The Barring History Record Card *(Fig. 2)* is a control card made out for each atlas page requiring barring on a routine survey basis. These cards are filed by year of the next survey, by town and atlas page number, and serve as a barring history record.

The Routine Barring—Specific Card *(Fig. 3)* supports the Barring History Card, giving the exact location of all mains on the atlas page involved. More than one card may be necessary. When all mains on an atlas page are to be barred, a notation is made on the Barring History Card and this form is eliminated.

A number of other forms are used to control the survey program, including a Public Building and Business Area Card and an Interstation Main Card.

From the survey information, all mains leaks are posted in the leak atlas, which then contains: (1) uncorrected leaks; (2) main inspection; and (3) main repairs.

A typical sheet from a leak atlas is shown in *Fig. 4*. This section of main should obviously be analyzed for replacement before any of these leaks are repaired.

The first number of each notation on the right side of the page indicates the seriousness of the leak. A Code 3 leak means action may be deferred long enough to make an economic analysis. A Code 2 leak indicates that this particular hazard does not necessarily override economics, that corrective action should follow routine channels. If an economic analysis indicates replacement but the necessary orders cannot be prepared to meet the time limit established in the field, temporary hazard elimination should be considered. The next figure in each notation indicates the gas concentration measured by a leak indicator. Next is the number of the work ticket on which this leak was reported from the field and the date the leak was reported.

At the top of the page, notice on the second line of the notation other coding which indicates that the leak was repaired. The "4" indicates the type of repair; the "3," the degree of pitting; the "2," the degree of rust; and the "8," that a 17-lb anode had been installed at this leak location. The date of repair is last.

A main inspection notation is shown at the left of the page. The "1's" indicate the degrees of pitting and of rust. The date the inspection was made follows.

As this information is assembled and posted on the leak atlas, a very fine historical pipe condition record develops. It then becomes the main source of information for any comparison between repair and replacement costs. It's a most important part of the yardstick that helps us decide whether we should "fix it or junk it."

This decision is based on a comparison of the cost of repair—which is an operating expense to the company and the customer in the year of repair—and the replacement cost—which is a capital expenditure amortized over a period of years.

A simplified, hypothetical example will show how this decision can be reached. Let us assume that a stretch of leaking main would cost the same amount, $1500, to repair or to replace. Let us further assume that the decision can be based solely on the economic aspects, since no other factors, such as local government or public relations, enter into the picture. With identical repair and replacement costs, it would seem obviously best to replace. But, replacement would be a partial expenditure with the assortment of addi-

LEAK SURVEY — ROUTINE BARRING -- SPECIFIC — Atlas Page No. _____

N.J.GAS CO. 1-1056 5-58

LOCATION OF MAIN TO BE BARRED	STREET WIDTH / TYPE PAVEMENT	DATE INSTALLED	SIZE	SOIL TYPE	YEAR BARRING STARTED

Fig. 3

tional expenses and red tape that involves. Since repair would simply be another operating expenditure for the year, it bears investigation.

An assumption to be made for this example is that the main, if repaired, would have to be replaced in five years. Two other figures established from experience are an estimated pipe life of 40 years and an annual capital cost rate of 10 per cent of the expenditure. (This rate includes return on investment, depreciation, federal income taxes, and other taxes; should be reviewed and adjusted from time to time to reflect any change in these elements.) The cost of the new main then, is $150 per year, 10 per cent of the total cost of $1500.

Now, let us determine the cost difference between repairing and replacing, bearing in mind that this is a simplified example. We'll set the cost study period at 45 years, the total of the estimated 5-yr life of the repaired main and the estimated 40-yr life of the new main that would replace the repaired main.

If the main is repaired at a cost of $1500, then replaced in five years; that $1500 must be added to the cost of the new main, $6000 ($150 per year for 40 years). Thus, the total cost would be $7500 at the end of 45 years.

If, on the other hand, the main was replaced immediately and replaced again in 40 years when it presumably ended its useful life, the total cost would be only $6750, or $150 per year for 45 years. Thus, at the end of 45 years it would be $750 cheaper to replace the pipe right now than to repair the pipe now and replace it in five years.

We decided on a period of 5 years for two reasons. First, the age and condition of much of the bare steel pipe and the limitation of cathodic protection under such conditions. Second, the period corresponds with our leakage survey cycle. When we gain more experience, this period may change to 10 to 15 years. The responsibility for deciding this belongs to the corrosion section of our engineering department.

In making the replacement vs. repair cost comparison, the Analysis Comparison Sheet *(Fig. 5)* is used. There is a column for the operating division and one for the engineering department since engineering may have information which would require a change in calculation.

Now, let us examine the factors that go into this cost comparison. The first is the replacement cost per foot. Since there are many items to consider before determining this cost, we use a separate form, Computation of Main Replacement Cost *(Fig. 6)*. This computation sheet is divided into three headings: material, labor, and other costs.

The material section includes the cost of pipe plus the storage and handling costs. This is multiplied by the number of feet to be replaced. Non-pipe material —tie-ins, valves, anodes—is then figured. We use an average based on charges to current work orders for 2-in. pipe. Over 2-in. is estimated as needed, with costs furnished by the engineering department. Again, these figures are multiplied by the number of items and entered in the outside column.

Labor cost breakdowns for the different types of work on each main replacement may be quite difficult. We decided on a cost-per-foot basis, based on an area description. The area descriptions were determined by observation of actual job sites, reviews of construction drawings, and discussions with company construction personnel. Labor costs were based on estimates of labor hours required for main construction

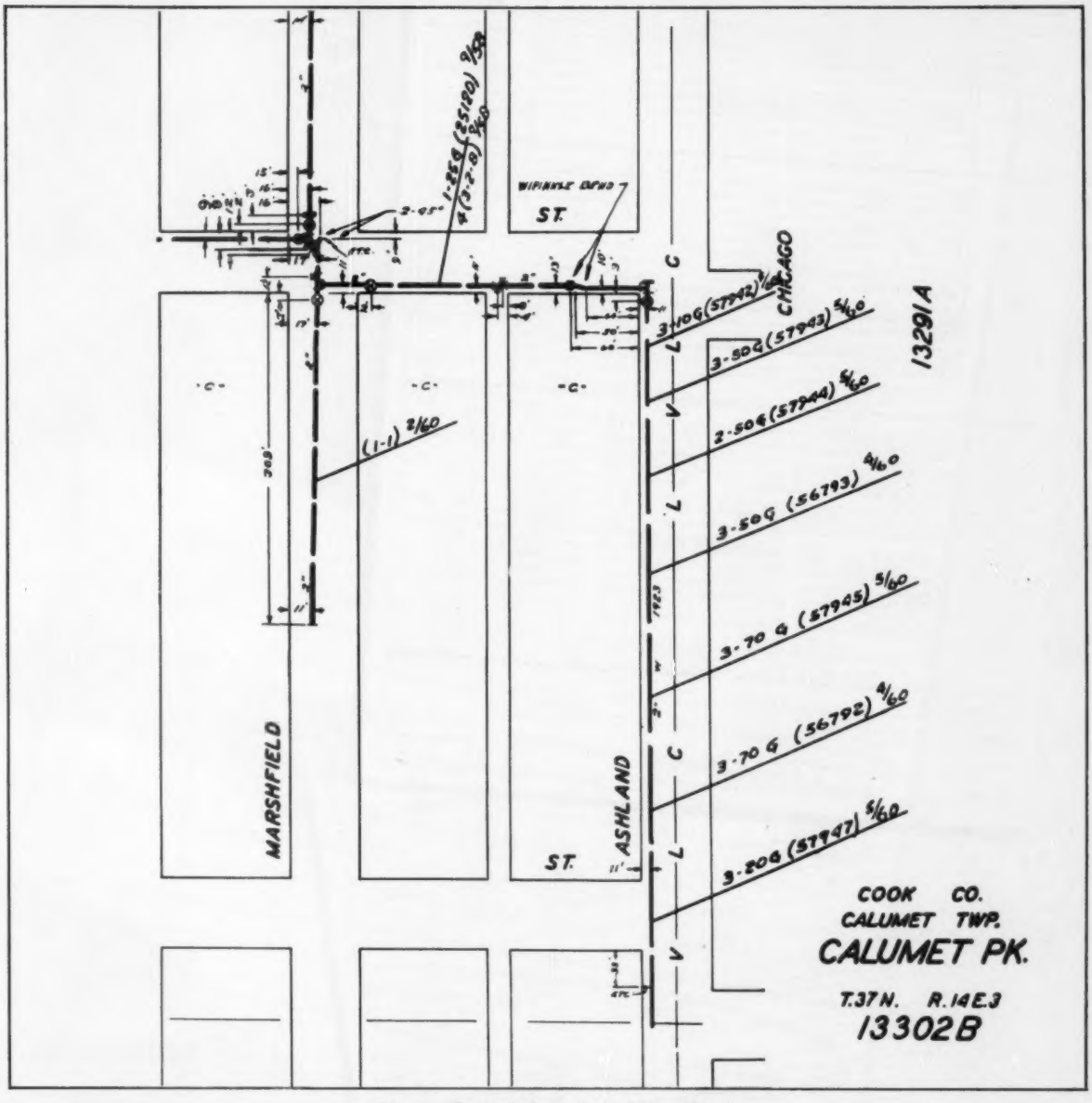
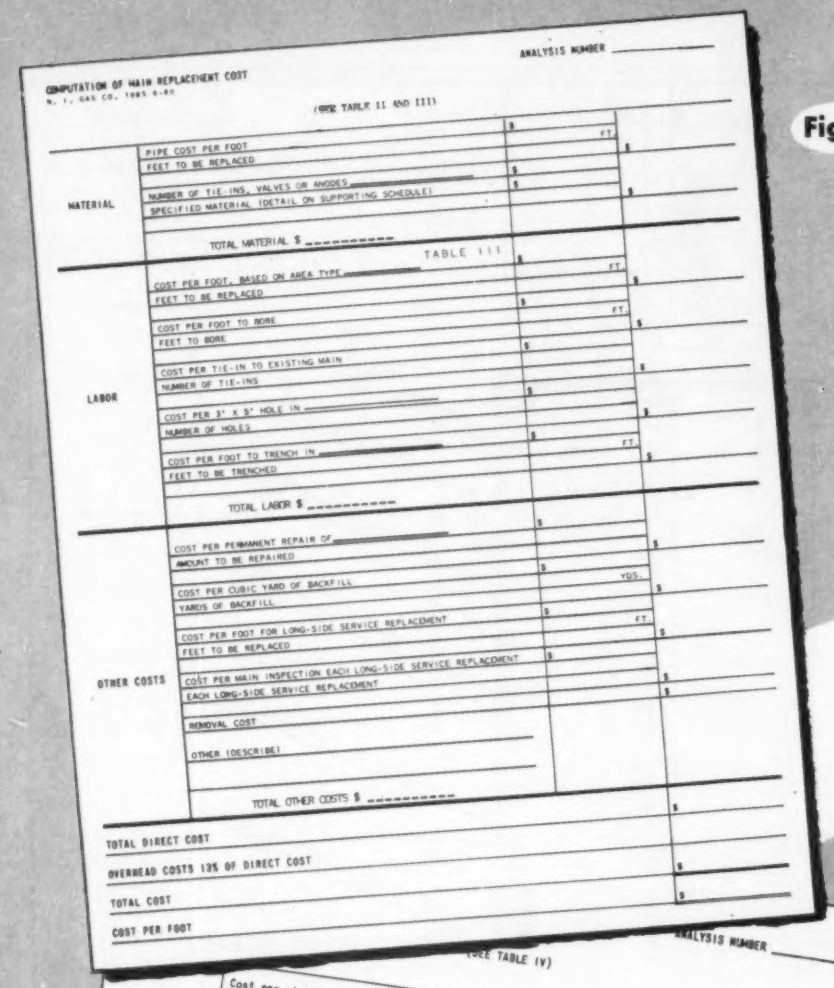


Fig. 4. Typical sheet from leak atlas.

for the various areas. They were adjusted, where necessary, after comparison with actual completed company and contractor job labor costs. Four area types were established, ranging from the minimum amount of work to the most complicated. The latter includes: difficult surface conditions, such as main laid under street; ditch must be tamped and damaged area restored to original condition; many underground or aboveground obstacles; heavily congested area; and rocky ground or unlevel area.

The classification is based on the most dominating factor and need not include all of the factors just listed. Also, the areas were further divided, according to the amount of pipe installed. For example, 200 ft would be more expensive per foot than 400 ft because of certain fixed costs that enter into any job, regardless of length. A table was prepared with estimated costs per foot for different main sizes and area types. To find the cost per foot, it is only necessary to know those two items. The other labor items, cost per foot to bore and tie-in costs, are listed in table form for various sizes of main. The cost to make a 3-ft-x-5-ft hole and cost per foot to trench are both broken down between a concrete pavement, concrete sidewalk, and blacktop. When these figures are all added, we then find our total labor cost.

Other costs include permanent pavement repair, backfill, long side services, inspection holes over main,



COMPUTATION OF MAIN REPLACEMENT COST

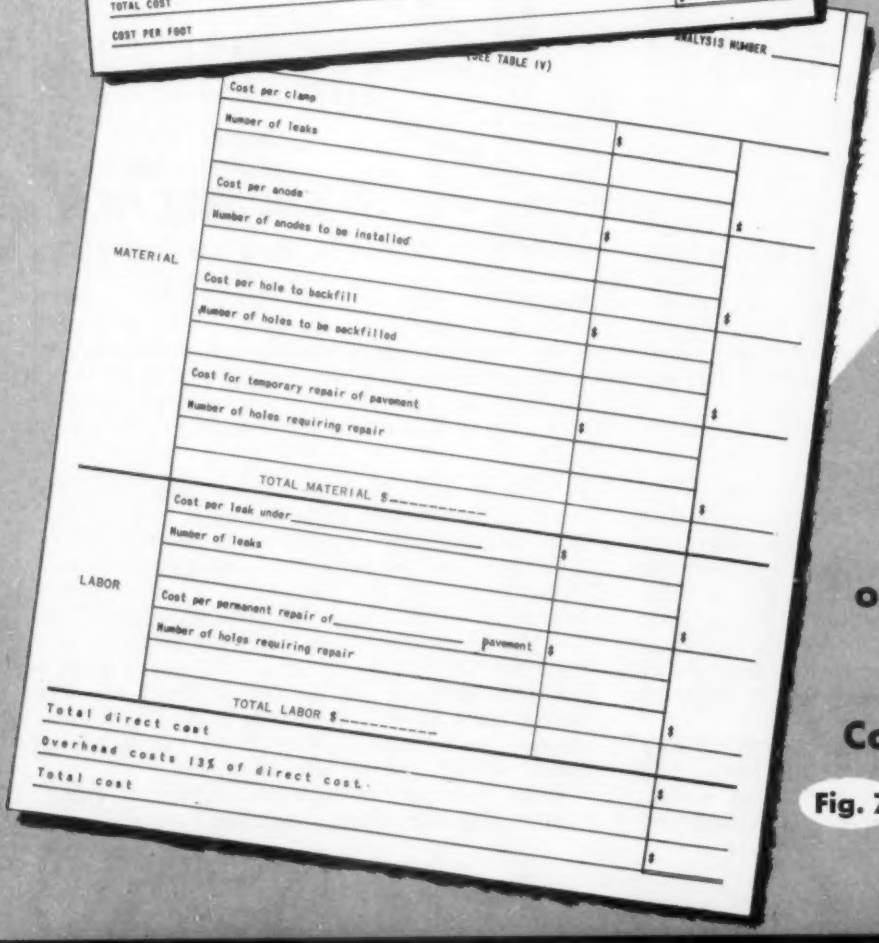
N. Y. GAS CO. 1095 6-60

ANALYSIS NUMBER _____

(SEE TABLE II AND III)

MATERIAL	PIPE COST PER FOOT	$		
	FEET TO BE REPLACED		FT.	$
	NUMBER OF TIE-INS, VALVES OR ANODES	$		
	SPECIFIED MATERIAL (DETAIL ON SUPPORTING SCHEDULE)			$
	TOTAL MATERIAL $ _____			
LABOR	COST PER FOOT, BASED ON AREA TYPE _____ (TABLE III)	$		
	FEET TO BE REPLACED		FT.	$
	COST PER FOOT TO BORE	$		
	FEET TO BORE		FT.	$
	COST PER TIE-IN TO EXISTING MAIN	$		
	NUMBER OF TIE-INS			$
	COST PER 3" X 5" HOLE IN _____	$		
	NUMBER OF HOLES			$
	COST PER FOOT TO TRENCH IN _____	$	FT.	
	FEET TO BE TRENCHED			$
	TOTAL LABOR $ _____			
OTHER COSTS	COST PER PERMANENT REPAIR OF _____	$		
	AMOUNT TO BE REPAIRED			$
	COST PER CUBIC YARD OF BACKFILL	$	YDS.	
	YARDS OF BACKFILL			$
	COST PER FOOT FOR LONG-SIDE SERVICE REPLACEMENT	$	FT.	
	FEET TO BE REPLACED			$
	COST PER MAIN INSPECTION EACH LONG-SIDE SERVICE REPLACEMENT	$		
	EACH LONG-SIDE SERVICE REPLACEMENT			$
	REMOVAL COST			$
	OTHER (DESCRIBE)			
	TOTAL OTHER COSTS $ _____			
TOTAL DIRECT COST				$
OVERHEAD COSTS 13% OF DIRECT COST				$
TOTAL COST				$
COST PER FOOT				

Fig. 6



ANALYSIS NUMBER _____

(SEE TABLE IV)

MATERIAL	Cost per clamp	$	
	Number of leaks		$
	Cost per anode	$	
	Number of anodes to be installed		$
	Cost per hole to backfill	$	
	Number of holes to be backfilled		$
	Cost for temporary repair of pavement	$	
	Number of holes requiring repair		$
	TOTAL MATERIAL $ _____		$
LABOR	Cost per leak under _____	$	
	Number of leaks		$
	Cost per permanent repair of _____ pavement	$	
	Number of holes requiring repair		$
	TOTAL LABOR $ _____		$
Total direct cost			$
Overhead costs 13% of direct cost			$
Total cost			$

Replacement and Repair Costs are computed on separate forms, entered on Computation Sheet

Fig. 7

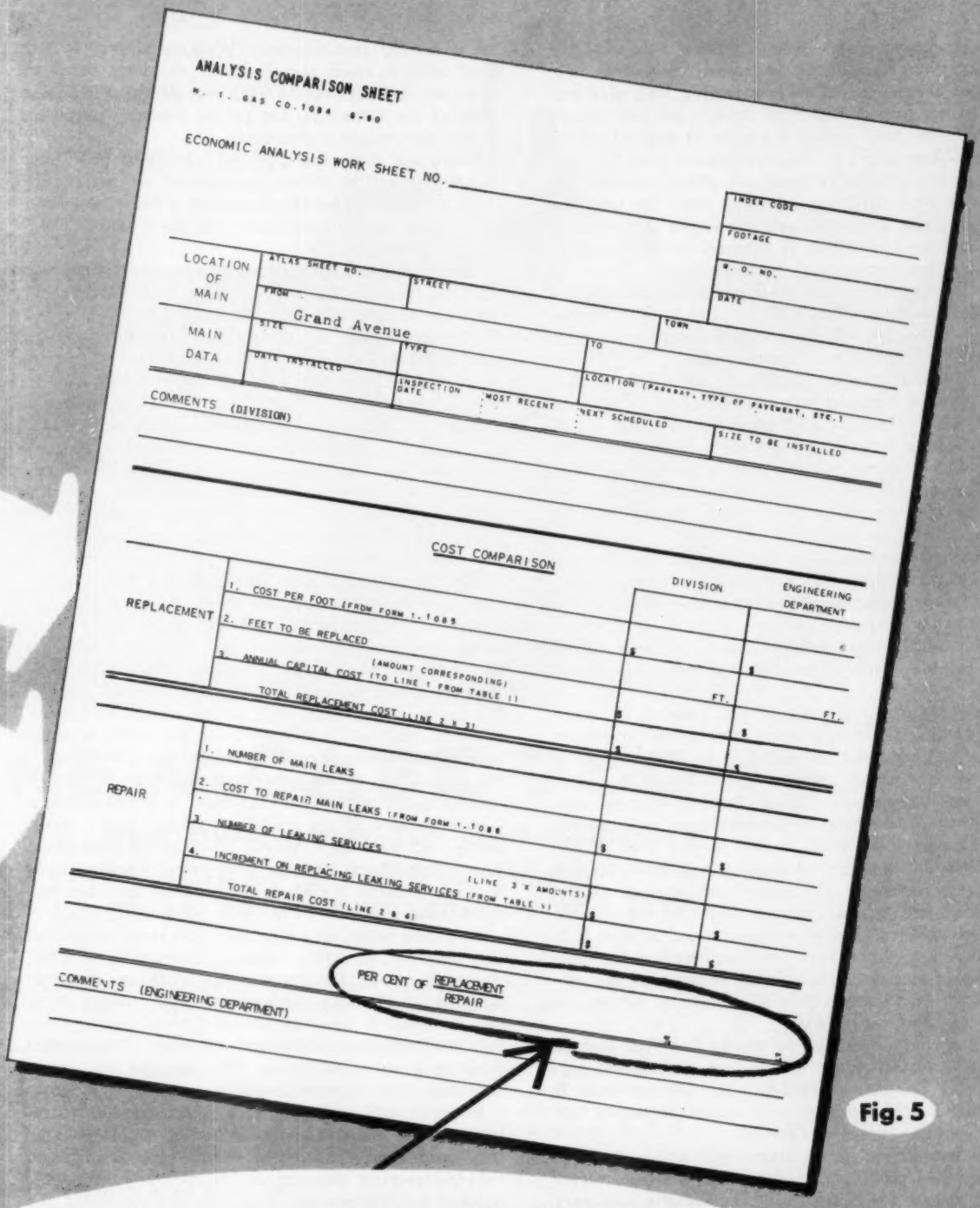


Fig. 5

Their percentage relationship

then becomes

the "Fix-It-Or-Junk-It" Yardstick

and all removal costs. The inspection hole over the main may not be familiar to some GAS readers. Because of several accidents in augering long side services (the auger damaged the main), we now expose the main by hand before augering is started. This, of course has added to the replacement cost.

When these three sections are added together, we have our total direct replacement cost. To this, the overhead costs are added and we arrive at a replacement-cost-per-foot which is entered on the Analysis Comparison Sheet.

We can now finish our cost comparison for the replacement portion. The next step is to convert the actual cost to the annual capital cost. This, then, is our comparison cost for replacement.

To determine the comparison cost for repair, a form similar to the replacement computation sheet is used. Called the Computation of Main Repair Cost Sheet *(Fig. 7)*, it is divided into two sections—material and labor. Tables were prepared so anyone with the basic data can develop this estimate with comparable ease.

Under material costs are clamps, anodes, backfill, and temporary pavement repair.

Labor costs in the tables are based on averages for three locations: parkway, blacktop, and concrete. Also, the cost for permanent pavement repair is shown for several types of surfaces.

These items, plus overhead, equal the main repair cost, which is entered on the Analysis Comparison Sheet.

The next item on the comparison sheet is the number of leaking services, which is determined by survey work. The increment on replacing leaking services is included only under cost to repair, since, generally, it is more expensive to replace leaking services as a separate operation rather than with main replacement. It is therefore assigned to the repair side of the equation. The greater investment will exist for the life of the service, so the annual capital costs on the difference will also be incurred for the life of the replaced services. For this reason (and because it is company policy to replace any bare leaking service) this figure can be a substantial amount in the economic formula. After this increment is added, we have the total repair cost.

Now, a comparison can be made. The "per cent of replacement over repair" can be used for several purposes. At present, anything under 100 per cent is replaced. But, depending on the money situation, this figure could be raised or lowered.

Jobs not scheduled for immediate action are filed in numerical percentage order. This file then serves as the source for periodically reporting a summary of future work to the general office. After reviewing the summary, the general office issues instructions as to what percentage group will be replaced.

We also established standards that result in replacements of economical lengths. A table was prepared, showing the number of continuous feet of leak-free pipe that could be replaced at a later date, lengths varying from 50 ft in difficult areas to 350 ft in less difficult areas.

Since it is hard to comply with all rules, some variations had to be written into the manual. In some situations, additional footage may be laid—primarily for operating requirements. We may add up to 100 ft of main to reach a cross-tie or shutdown valve, to cross an intersection, to pick up all the remaining main of the same age, for public relations purposes, or for systems improvements.

There are also some physical conditions producing mandatory action, either replacement or repair. In those cases not based on economics, a full explanation is included under "comments" on the Analysis Comparison Sheet.

The conditions that indicate mandatory replacement are: (1) pipe condition is so poor that repairs will not stop leakage; (2) leaks in cased pipe; (3) physical inaccessibility of leaking pipe requires replacement in new location; and (4) government restrictions on cutting pavement necessitates replacement in new locations.

The conditions that indicate mandatory repair are: (1) hazard requires action in less time than replacement work can be accomplished; (2) isolated mechanical damage to pipe otherwise presumed in good condition; (3) leakage where government restrictions prohibit replacement; and (4) leak frequencies of less than one per 100 ft.

We have found, since this program was started, that our records are much more complete and are uniform throughout the company. It makes it much easier for people going from one area to another to keep our records in order. Our leak atlases now make it much easier to determine the condition of a main. We know that coding, such as the degree of pitting and rust, will not be accurate; but we feel it is much better than saying a main is simply "good" or "bad." We know that we have replaced many more feet of leaking main in the last year than in previous years —both because of our drilling machines and a much better historical main record. Many of the mains that should have been replaced years ago, were repaired instead—because the whole condition of the main was not known.

Cost data were not available at the time we started this program, in 1959. Since the beginning of 1960, the engineering department has made an economic analysis of all main replacement jobs coming from the divisions to find out if our figures were correct and how well our program would work. The results have been very gratifying. We can see long-range economies and improved control.

Recently, all divisions were given the cost data necessary to analyze main replacement jobs. After they make their analyses, all comparisons are sent to the engineering department, where they are spot-checked for correctness. The jobs not scheduled for immediate action are filed in percentage order in the engineering department, which keeps this file for a summary of future work.

To keep this program from becoming stagnant, we must continue to systematically study and evaluate the effectiveness of cathodic protection, internal main treatment, and other methods of main repairs; and we must keep our cost figures current. With this done, our system will improve. We will get long-range economies, improved control over replacement, better relations with public authorities and—above all—the safety of our customers and public. ■

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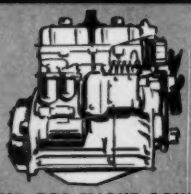

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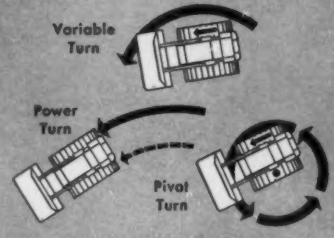

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Ken Kridner addresses the New York session.

GAS holds briefing on automation series

MANHATTAN'S Roosevelt hotel was the scene of a "Briefing Session on Automation in Gas Industry Operations" staged by GAS Magazine in March. As readers of GAS will know, we are currently publishing a series of articles on the subject written for us by Ken Kridner.

On March 17, we brought Kridner to New York to brief engineering firms, equipment manufacturers, association executives and gas company people in the area on what he had seen and learned during his tour of automated gas-industry installations.

About 80 persons attended. The meeting was broken into a morning session, which was followed by cocktails and a buffet lunch. Guests regrouped after lunch for further briefing and discussion.

Those attending were:

A. A. Alexander, J. W. Cooper, R. M. Gryb, Leonard D. Schmidt, and Donald E. Williams, American Telephone & Telegraph Co., New York; from Royal McBee, Lee Albers (New York), Floyd J. Ritchie and Howard Thomson, Port Chester, N. Y.; Dave Anderson and Tom Hayes, Philadelphia Gear Corp., King of Prussia, Pa.; Michael Anuskiewicz, Brooklyn (N.Y.) Union Gas Co.; Carl J. Bartoseski, North Electric Co., Galion, Ohio.

E. Bragunier, F. G. Cunningham, Northrop Fletcher, and H. P. Richmond, Ebasco Services Inc., New York; George E. Breece and Frank H. Stephan, Warren Engineering Co., Broadway, N. J.; W. T. Brophy, N. V. Calzolari, and J. E. O'Hara, Federal Electric Corp., Paramus, N. J.; David V. Buchanan, R. Marples, and V. Salzone, Consolidated Edison Co., New York; Ronald Carruthers, ITT Kellogg, Chicago.

James Casserly and Ben Nauss, ASCOP Div., Electro-Mechanical Research, Princeton, N. J.; F. G. Clay and John H. Hewson, Foxboro (Mass.) Co.; Bob Cook, Union Switch & Signal, Pittsburgh; from General Electric, W. E. Cowles and K. J. Worthen (Lynchburg, Va.), and Gene Lanigan (Schnectady, N. Y.); James F. Craib, Cutler-Hammer Inc., New York; Donald T. Cusack, Hagan Chemical & Controls Co., Pittsburgh.

Bob Fopeano, Bendix Computer, New York; Ken Dumas, Stanley N. Neigut, and Robert E. Peterson, Philco Corp., Philadelphia; Stan Erickson, Magnatrol, Inc., Downers Grove, Ill.; W. C. Filbert, Remington Rand Univac, West Lafayette, Ind.; from IBM (New York), L. T. Frohman and Dave Hart, and Bill Walker from Newark, N. J.; H. Gottwald, Rockwell Manufacturing Co., Pittsburgh; E. J. Grace, Telechrome Manufacturing, Amityville, N. Y.

Rudolf Gyr and Jim White, Ingersoll-Rand Co., Painted Post, N. Y.; Charles S. Harris, Hammarlund Automation Div., Amityville, N. Y.; E. J. Hart, RCA, Camden, N. J.; Dick Young, Standard Electric, Springfield, Mass.

L. V. Hickman, American Meter Co., Philadelphia; Lester B. Inglis, American Gas Association, New York; R. D. Kingston and George Orelli, General Telephone Service Corp., New York; Murray Kraus and John F. Pink, CompuDyne Corp., Hatboro, Pa.; Warren C. Marshall, Burroughs Corp., New York; Chet Menkes, Quindar Electronics Inc., Bloomfield, N. J.; W. J. McAllister and B. P. White, Leeds & Northrup Corp., North Wales and Philadelphia, Pa.; George Olsen, General Telephone & Electronics Corp., New York.

Abe Propper, Quindar Electronics, Inc., Bloomfield, N. J.; Paul Quantz, RCA Industrial Systems Div., Natick, Mass.; Victor Rubilotta and C. H. Van Orden, Western Union Telegraph Co., New York; Walter Rufleth, Bristol Co., Waterbury, Conn.; Raymond Schneyer, Curtiss-Wright Corp., Princeton, N. J.; Oscar Soroko, Fischer & Porter Co., Warminster, Pa.; Edmund W. Stabile, B-I-F Industries, Inc., Providence, R. I.; Jack T. Teed, Minneapolis-Honeywell, Philadelphia; and Ralph Urso, McCord Corp., Detroit.

GAS Magazine personnel: Ken Kridner, consultant, Woodsboro, Texas; John H. Kofron, director of research, GAS and Chilton Co., Philadelphia; J. Fred Ebdon, editor, Los Angeles; William T. Harper, eastern editor, Philadelphia; Richard Duffy, New York representative; and Joseph R. Geryk, Cleveland representative. ■

Views of participants at GAS' briefing session.

Inserting 3-inch pipe made of MARLEX (lengths previously joined by butt-fusion) through old 6-inch steel pipe. Insert photos show new 2-inch main with joined 1-inch service (also MARLEX) . . . and butt-fusion rig with completed joint.

Union Gas System, Inc., installs pipe made of MARLEX*. . . joining costs 83% less than steel

Union Gas System, Incorporated, Independence, Kansas, has recently replaced some 10,000 feet of leaking and corroded steel gas lines with pipe made of MARLEX high density plastic. The job was done with much of the MARLEX pipe inserted through existing steel lines—in Skiatook, Oklahoma, and Caney and Coffeyville, Kansas.

Mr. Forrest Martin, District Superintendent, says, "these installations with MARLEX pipe have really been an eye opener for our company. In pulling through old lines, we installed 1500 feet in four hours at Caney . . . and 3040 feet in even less time at Coffeyville." He adds, "In a time study, we found that two men with a butt-fusion rig joined 800 feet of MARLEX pipe and installed several service "T's" in four hours. The same job with steel pipe and welded joints would have taken four men at least 12 hours . . . *conservatively an 83% reduction in joining costs with MARLEX pipe and fittings using the companion butt-fusion process.*"

Mr. Martin concludes, "MARLEX pipe and butt-fusion should really revolutionize gas distribution! There is the expectation of an almost indefinite, corrosion-free service life . . . and the pipe itself is inexpensive, lightweight, easy to handle and install."

In addition to being lightweight, coilable and straight lengths of pipe made from MARLEX TR-212 (ASTM Type III polyethylene) possess excellent load bearing characteristics and a wide usable temperature range. This pipe is also virtually indestructible . . . resistant to solvents, acids, alkalies, oils, bacteria, rot and fungi.

*MARLEX is a trademark for Phillips family of olefin polymers.

For more information, see your pipe supplier . . . or contact us.

PHILLIPS CHEMICAL COMPANY

Bartlesville, Oklahoma

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PHILLIPS 66 MARLEX PLASTICS

GAS DISTRIBUTION NEWS

Unity a mirage . . . Potter

A time for vision . . . Schuette

Chases away recession gloom . . . Strauss

Problems of success, unity highlight Omaha meeting

Two types of unity and problems of success were top topics at the 56th annual Mid-West Gas Association convention (Omaha, late March). Nearly 450 members of gas industry management from 12 states received — among other things—a dispatch from the hot and cold running war and a report from a renowned researcher.

"Unity has been a mirage," said Lester T. Potter, president of AGA and Lone Star Gas Co. "Whether we like it or not, our industry has three divergent interests: the producer, the pipeliner, and the distributor. These divergent interests will continue, but they can be reconciled with harmony."

The chief difficulty, Potter explained, has been simply that the three interests have not understood each other. He related how SGA made the first moves to foster this understanding, getting together unofficial representatives of the three groups; and how these meetings

Soft as Moonlight . . .

The mellow glow of Gaslites adds delightful charm and interest to any outdoor setting. For information on the golden-crested Embassy or other distinctive Gaslites by Arkla, write

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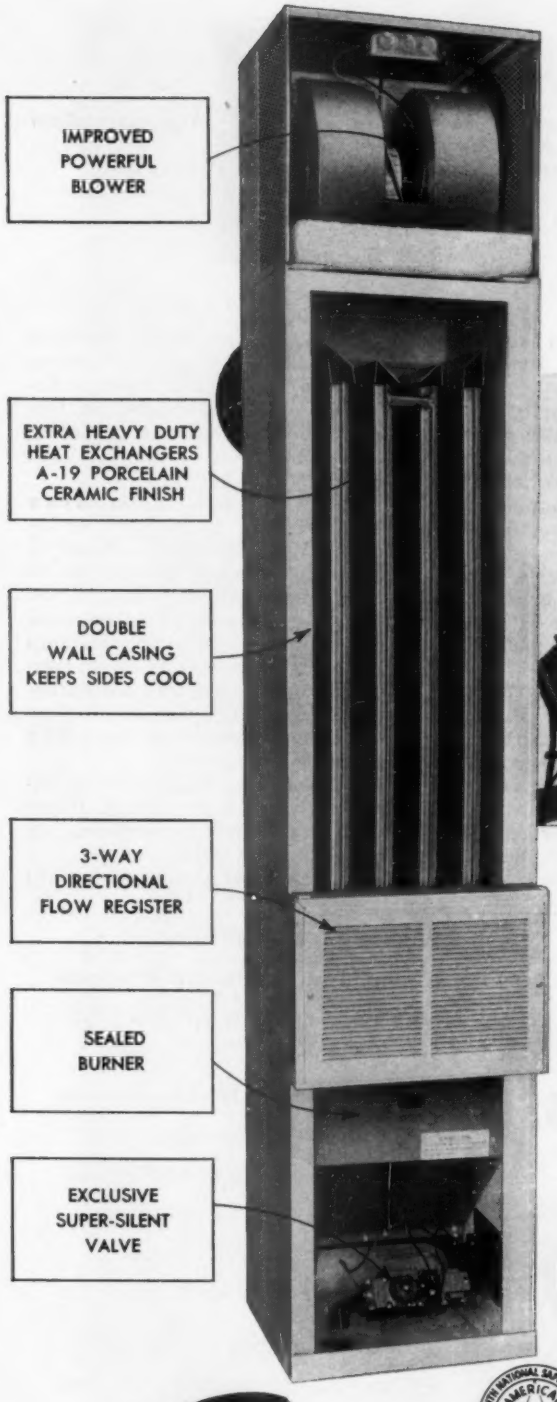
SHANNON BUILDING • LITTLE ROCK, ARK.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EXTRA HEAVY DUTY HEAT EXCHANGERS A-19 PORCELAIN CERAMIC FINISH
DOUBLE WALL CASING KEEPS SIDES COOL
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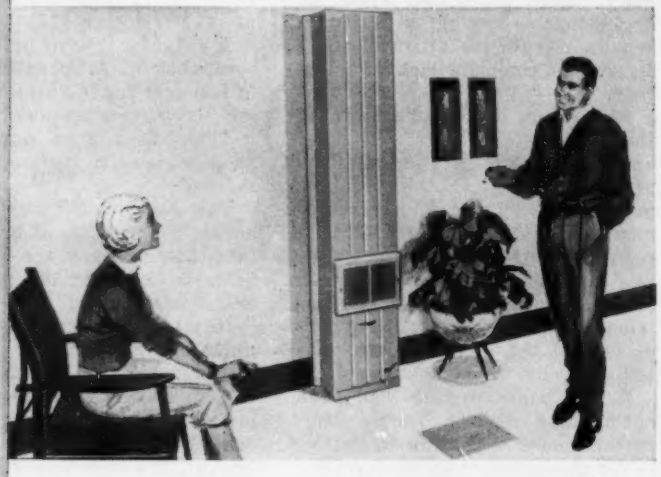

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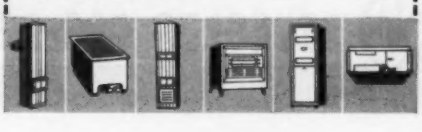

Empire

MEMBER NATIONAL LP-GAS COUNCIL

PACESETTERS IN QUALITY, COMFORT AND ECONOMY

Problems are problems of success . . . Mayer

Things are bad for K.C. killowatters . . . Fink

Supplemental gas in the 1970's . . . Elliott

have since been cloaked in legitimacy. More important, while the first delegates brought with them a What's-in-it-for-me attitude, there is now "a complete lack of advocacy."

As a result, Potter continued, the three interests came to four basic understandings: (1) There is no perfect solution to the producer problem; (2) The producer recognizes that he must be subject to regulation; (3) The pipeliner realizes that he is more than a broker and transporter; and (4) The distributor realizes that both the producer and the pipeliner have mutual problems which must be solved.

A four-point program has come out of these sessions. The most important point, according to Potter, is for the industry to develop—for the first time—the real, complete gas industry story. This story must be told—not only to the public—but to industry, itself, to develop real unity.

A different type of unity was advocated by W. A. Schuette, manager of Hausgas Inc. (Washington, Mo.) and second vice president of LPGA.

"This is a time our industry needs vision like it never needed it before."

The electric industry's current all-out effort makes it more important than ever that the LPG dealer hold the load for the gas utility, Schuette explained.

He cited three ways in which this unity can be achieved. First, the utility should invite nearby LPG dealers to run small tie-in ads below its large newspaper ads. Second, the utility should invite dealers in for a once-a-year get-better-acquainted visit. Third, the utility should reimburse dealers when it takes away customers. Schuette designated East Ohio Gas Co. co-op plans as the blueprint which all future plans should follow. In this plan, compensation varies according to the individual load, from $15 to $140.

The two-day meeting started on a positive pitch. In his opening remarks, W. A. Strauss, president of Northern Natural Gas Co., one of the host companies, ticked off two facts to chase away any recession-gloom present. First, membership in the association is at an all-time high, 650. Second, the convention was being held in one of only four cities in the nation not faced with a labor surplus.

This positive approach was immediately picked up by J. S. Mayer (Northern States Power Co.) in his president's message:

"So many of our problems are

A BELL RINGER FOR SAVINGS!

BELL CRANK ASSEMBLY
includes hex aluminum slide, bell crank of rust-resistant cold-rolled steel.

We swapped a bell crank assembly for the famous Reynolds toggle assembly in our Series 8010 House Service Regulator . . . And created the NR*B* 8010 as a companion to the toggle type, the NR*T*. For real economy, the new NRB 8010 rings the bell! . . . You can't beat the *performance* of either model of the reliable Reynolds 8010!

We'll be most happy to send you complete information, take your order, and ship you a carton or a carload!

Write, or phone 644-1291.

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REYNOLDS GAS REGULATOR CO., INC., ANDERSON, INDIANA

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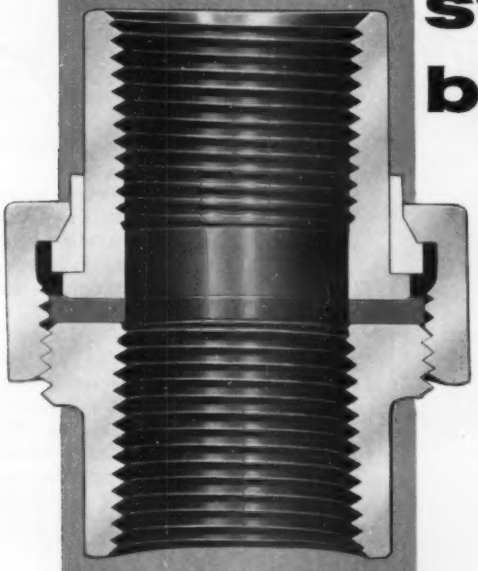
1.

Maximum safety — Through the strength of steel. No sand holes, no porosity.

2.

Extra strength — Original heavy-duty tapered insulator is three times stronger than light, square type.



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Leak-proof — Full-formed threads assured by Army-Navy gaging procedure.

4.

Quick identification — Easy-to-see color coding: Special-orange; High Temperature-yellow.

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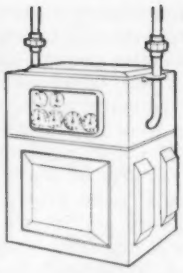
SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS



install meters with insulating unions—

stop "corrosion by electrolysis"

Corrosion engineers specify CAPITOL gas service insulating unions for meter installations. Stray or induced house currents in the gas lines are stopped, preventing electrolysis and damage to piping and meters.

CAPITOL's insulating unions were designed specifically for gas service to meet the requirements of leading corrosion engineers. Performance proved by years of service. Available in two types: The *Special* insulating union is recommended for normal applications; the *High Temperature* insulating union, designed for maximum protection against gas leaks in the event of fire, withstands 450°F external heat for one hour.

Add to the life of your company's gas mains. Use CAPITOL performance-proved gas service insulating unions on all meter installations.

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Division of Harsco Corporation, Columbus, Ohio

CAPITOL

actually problems of success," said Mayer. "Many of us . . . have told our public, ourselves, our customers, and our salesmen that the gas industry has grown to be the fifth largest industry in the nation . . . Have some of us let this bigness . . . take us away from Main Street?"

There are many vivid illustrations that utility merchandising and dealer promotion combined are the most effective method of load-building. But, how many of us fully realize the importance of adequate and economical service to any policy to merchandise gas appliances?

"You and I who operate the gas utility have the moral obligation to make certain that adequate service is available, if not by an appliance dealer, then by the utility . . . It (does not have) to be free . . . If our customers do not receive such service, we will not necessarily lose our franchise. We merely lose our customers to our competition.

"This obligation of adequate equipment for our industry goes beyond the utility, to the manufacturer . . . The manufacturers of production, transmission, and distribution equipment, as a whole, have fulfilled their obligations of quality and service.

"As a whole, the appliance industry has not fully met its obligations. On occasion, new models have been placed on the market without adequate tests of new features. The service manuals are not made available to the dealers and little or no serviceman training is given before the appliance is sold to the customers."

Battlefield reports on the hot and cold war between gas and electricity for the heating and air conditioning loads were presented by Bob Fink, director of air conditioning for The Gas Service Co., Kansas City, Mo.

Things are so bad for Kansas City Killowatters that one contractor advertises he'll pay the purchasers' heating bills for three years, if someone will buy his electrically heated homes.

In his area, Fink reported, heating equipment installation costs are about the same; but on operating costs, gas beats electricity by a minimum of 2 to 1, a maximum of 6 to 1.

On the cold front, Fink noted, gas has already captured 25 per cent of the domestic air conditioning market in which it competes. And more ammunition is on its way to this front, since many manufacturers are getting into gas air conditioning. Among the new names entering the field are: Caterpillar, Bell & Gossett, and Waukesha.

Air conditioning research was one of the many research topics covered by Dr. Martin Elliott, director of the Institute of Gas Technology. In citing some of the most promising projects outside the institute, he mentioned (1) a 250-hp regenerative gas turbine under development (at Solar Aircraft Corp.) as a long-life competitive prime mover for air conditioning or power generation; (2) a Worthington Corp. project to develop a 50-ton gas engine-driven heat pump.

Other non-IGT projects bearing watching are: the application of computers for automatic pipeline control, use of high strength steel pipe, accurate and economic design of multiphase flow pipelines, completely automatic inspection of line pipe, and more effective use of underground storage.

Dr. Elliott reported in some detail

Rx FOR SURE PROTECTION

You've made a worthwhile investment in this pipe. You've spent some more on cleaning and coating. Why risk the cost of digging it up in a few years to repair corrosion damage?

With ERP protection you won't need to. Electro Rust-Proofing takes care of those pinpoints of corrosion that even the best coating cannot prevent. When your pipeline is laid, ERP makes a test survey to determine your needs. Once cathodic protection is installed, a periodic service visit by ERP engineers keeps your pipeline new—for good. They adjust your protection as your needs or environmental conditions vary.

ERP installs corrosion protection anywhere . . . at any time. But your greatest savings come if you call ERP early . . . if you plan your protection while you plan your pipeline. Write ERP today— Dept. E.55.51.

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A SUBSIDIARY OF WALLACE & TIERNAN INC.
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B&W's
NEW FITTINGS
PLANT IS IN
FULL OPERATION

YOU GET FITTINGS AND FLANGES
MADE BY ENGINEERS FOR ENGINEERS

Take B&W Orifice Flanges for Instance: Piping Engineers commonly refer to an Orifice Flange as the "Cash Register" of the piping system. Metering has to be precise . . . never varying. To accomplish this, these "cash registers" have to be *engineered* to permit accurate measuring . . . year after year after year. B&W Orifice Flanges have been designed and engineered to do just this. Take a look at some of the features. Compare them with the flange unions you're now using.

1. Extra long bolts to permit insertion of all orifice plates and gaskets and still have ample threads for proper bolting. Semi-finished hex nuts exceed specifications.
2. Plugs are precision made (not cast) and machined from same material as flange. Plug hole is chamfered for easy plug insertion.
3. Metering hole is a true 180°. Tolerances are near perfect. Hole is packed with grease to reach you in finest possible condition.
4. Jack bolts are "man-size" — won't twist off or bend under pressure. Machined jack bolt slot acts as wrench lock.

B&W, at their new Fittings Plant in Beaver Falls, is now producing "engineered" Orifice Flanges. For further information on type and sizes available, write for B&W Bulletin TF-507 or contact any B&W District Sales Office. The Babcock & Wilcox Company, Tubular Products Division, Fittings Plant, P. O. Box 230, Beaver Falls, Pennsylvania.

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TUBULAR PRODUCTS DIVISION

Seamless and welded tubular products, solid extrusions, rolled rings, seamless welding fittings and forged steel flanges — in carbon, alloy and stainless steels and special metals

on four IGT projects, two short-term and four long-term. The short-term projects involve two of the industry's most pressing problems, large-scale storage and pinpointing distribution system leaks.

One of the most promising ways of storing large quantities of natural gas is in a liquid state at atmospheric pressure in a refrigerated, subsurface, reinforced-concrete, insulated-roof structure. IGT has tested several small working models. Cost has been estimated at 80 cents to $1.50 per Mcf (depending on the existing ground water level) as compared to $2.85 to $3.43 per Mcf for aboveground tanks. If a 1000-bbl prototype tank to be built and tested in the coming year is successful, the industry may have a safe, economical method of storing liquefied natural gas.

Preliminary studies revealed that sonic methods offer great promise for pinpointing distribution system gas leaks. Two methods are being developed. One in which the leak itself is detected should prove suitable for most leaks. In the other, a tracer signal is emitted inside the pipe when the leak's sound level is too low. Both methods have pinpointed leaks covered with 5 ft of compacted soil. Field testing will begin in 1961.

Long range projects described by Dr. Elliott were: physical properties of gases, basic reaction of gases, fuel cells (IGT's fuel cell work was described in April GAS), and supplemental high Btu gas.

The demand for data on the physical properties of gases increases continually because advancing technology extends limits of pressure and temperature at which gases are handled and processed. Typical applications for these data include: flow of fluids in reservoirs, separation of gases, processing of gases, evaluation of gas liquefaction cycles, and analysis of absorption refrigeration cycles. A continuing program obtains data on the thermodynamic properties and viscosity of gases and liquids, permitting more accurate prediction of the flow of fluids in porous media and helping evaluate the performance of petroleum and natural gas reservoirs.

Current research on the basic reactions of gases include studies of: combustion at surfaces and in porous media, flames from porous plate burners, reactions of reducing gases with iron and iron oxide, and oxidation of methane by solutions containing iron salts. Data on various combustion systems and techniques furnishes information on their applicability and behavior. Work on reactions with iron oxide may lead to more economical gasification processes; on oxidation of dissolved methane, to simpler fuel cells operating at lower temperatures.

"Development of processes that will insure a competitive long-range source of supplemental high-Btu gas is one of the industry's most important areas of research," said Dr. Elliott. "Processes are being developed to use the abundant raw materials, coal and oil shale. Between 9 and 16 years will be required to develop proved full-scale processes . . . Since we are now in the pilot plant development phase . . . the industry will have available supplemental gas . . . sometime in the 1970's. This is the decade in which synthetic pipeline gas may be needed, according to some analyses."

Two processes for synthetic gas are being developed. In the methanation process, a high-Btu gas, mostly methane, is produced from a mixture of carbon monoxide and

Why Relieve Gas?

...use SECURITY

Automatic Shut-Off Valves

When pressure gets too high, Security Valves provide instant, automatic shut-off. As no gas is relieved, venting problems are eliminated. Long life and trouble-free operation is provided, too. Design has evolved over a 10 year period, making them the safest and most reliable on the market. Choose from largest selection. Available in sizes ¾" through 2", in a variety of models for high or low pressure application. Special models on request. Send now for full descriptive literature.

Standard of the industry for protecting gas distribution systems from over-pressuring.

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hydrogen made from coal, oxygen, and steam. The hydrogasification process involves direct hydrogenation of either coal or oil shale. The second process appears much more economical, estimates running from 50 cents to $1 per MMBtu as compared to $1 to $1.25 for methanation. Comparing the cost of gas produced from coal to electricity produced from coal, gas would win by a 3.7 to 1 margin. The cost to a residential customer on an MMBtu basis, would be $2 for gas from coal, $7.42 for electricity from coal. Thus, gas is truly in an excellent long range competitive position.

Southern Union, PSC in New Mexico court

The rate dispute between Southern Union Gas Co. and the New Mexico PSC is being heard by a district judge in Santa Fe, N.M.

Southern Union brought the suit challenging a year-old commission order flatly rejecting rate increases of about 20 per cent.

The increases have been in effect provisionally since September 1959.

Southern Union appealed the PSC order on 53 grounds. Included were two allegations that former Gov. Burroughs interfered in the case and that the ruling did not reflect action of the commission.

Earlier the court denied a commission motion to remove from the case the two objections dealing with Gov. Burroughs. Additional motions on these objections likely will be heard before the case is completed.

Also expected to be a key issue is Southern Union's tax liability. During commission hearings, the company placed its tax liability at $1.69 million. PSC cut this figure to $713,317 actually allowed.

Also due for an airing is the fair value rate base. Southern Union computed its rate base at over $58 million. The commission allowed a rate base of over $52 million.

Rugged Design...
Easy-to-Handle Balance

RIDGID
HEAVY-DUTY
PIPE
CUTTERS

give faster, straighter cuts

Five Sizes for ⅛" to 6"

FACTORY TESTED

Pick up a RIDGID Heavy-Duty Pipe Cutter, and you'll instantly know why it makes pipe and conduit cutting far easier. Perfectly balanced . . . gives you a feel of confidence no other cutter can match. See the extra-long shank that protects handle threads . . . assures easy pressure application. Feel the large, smooth handle that gives you a comfortable, powerful grip. Try it, and you'll find a built-in cushion to keep the cutter wheel "on track" through hard or uneven spots. Rugged frame, guaranteed not to break or warp, stays straight for clean cuts every time.

You'll Want a RIDGID 4-Wheel Pipe Cutter for Work in Tight Places!

Call your Distributor today. For your convenience, he maintains a complete stock of RIDGID Work-Saver Pipe Tools and Parts!

RIDGID

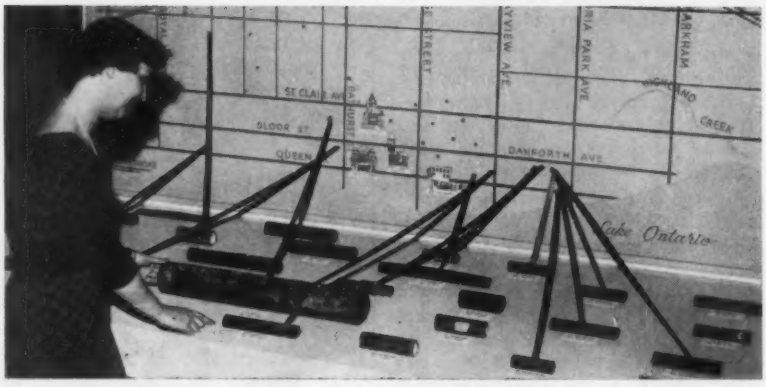
The Ridge Tool Company, Elyria, Ohio, U.S.A.

First heat campaign in 20 years hits Chicago

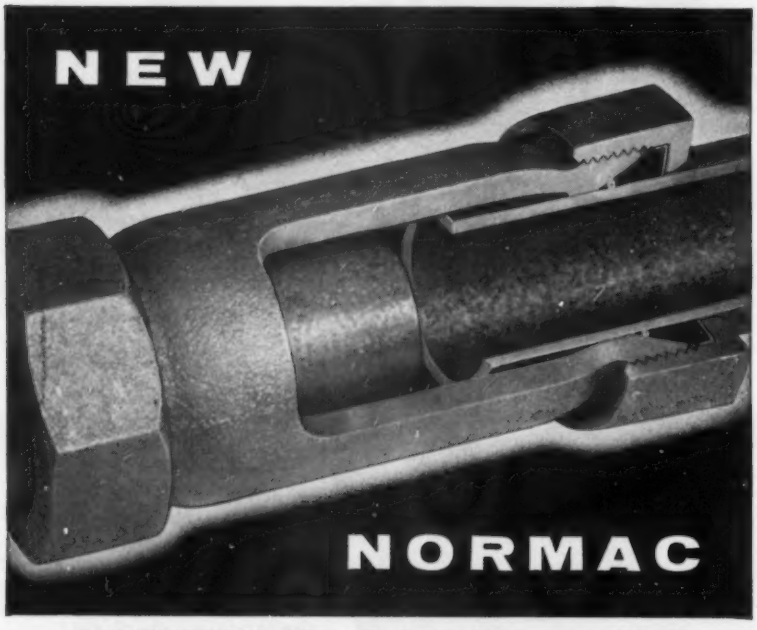
Peoples Gas Light & Coke Co., Chicago, has launched its first gas space heating sales campaign in 20 years. Major emphasis is on newspaper advertising. Peoples Gas said this is its largest single-theme promotion since 1941.

Promotional emphasis is on the theme that for the first time since 1946 gas space heating is available for all Chicago homes, apartment buildings, institutions and businesses. Peoples Gas recently received Illinois Commerce Commission approval of its revised space heating authorization procedure.

In addition to daily newspapers, Peoples Gas' ads are appearing in neighborhood papers and trade publications, on outdoor posters and on radio spots. Window banners and other dealer aids are available.



Forty-seven-year-old cast iron pipe still in excellent condition was part of an extensive gas safety exhibition shown recently to members of the Ontario (Canada) legislature and provincial departments by Consumers' Gas Co., Toronto. The display was developed to show that Consumers' personnel know their jobs. More than 50 exhibits explained operating methods, including pipe-laying, pipe protection, leakage surveys, installation of equipment, and training of personnel.



MODERNIZED Extra Heavy Wall
All-Malleable COUPLING
Provides More Deflection Than Ever

Engineered in line with latest data on distribution pressures and installation ease. Inspect its construction and quality materials in detail. (Available with Normac INSULATING gaskets).

BRASS FITTINGS
IRON BODY COCKS
INSULATING GASKETS
SELF-LOCKING JOINTS
BELL JOINT CLAMPS
SERVICE TEES, ELLS
METER BARS
COUPLINGS

MALLEABLE SERVICE ELL
Maximum stab. All sizes, with or without insulating gaskets. Also in brass 1¼ I.P.S.

BRASS FITTINGS
The most complete line for copper or plastic tubing in ⅝, ⅞, 1⅛, 1⅜ O.D., 1¼ I.P.S.

Top Quality for 22 Years in Gas Distribution Equipment

Get helpful CATALOG 12. Photos, specs, detail drawings & much helpful data for modernizing or new installations.

PERMANENCY Rely on NORTON-McMURRAY for the finest! NORMAC continues to modernize and improve couplings and fittings in step with latest gas distribution demands. 22 years experience concentrated on ONE purpose . . . the BEST! Today, major gas distribution companies say "NORMAC" to define their standard of quality.

NORTON - McMURRAY Mfg. Co.
919 N. Michigan Ave • Chicago 11, Ill.

Illinois Power seeks building permit

Illinois Power Co. has asked the Illinois Commerce Commission for a certificate to build a 29-mile pipeline from near Tuscola to Decatur. The line would connect with the mainline of Trunkline Gas Co. five miles southwest of Tuscola.

Trunkline and Illinois Power have completed a contract for purchase of 25 MMcfd. Trunkline now must get FPC approval to expand its facilities to deliver the gas.

With the new gas supply, Illinois Power would be able to satisfy the 4500 Decatur area residents who want to heat with gas. It also is expected that nearly all residential heating requests in Clinton, Champaign-Urbana, Jacksonville, Galesburg and Danville can be filled.

Continued on page 165

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thanks to you... we've expanded!

PLICO PIPELINE INSULATING SPACERS

BECAUSE OF YOUR SUPPORT OVER THE PAST YEARS, we've been able to expand our facilities at PLICO...a new and bigger plant...a new address...better-than-ever service! The one and only original PLICO Pipeline Insulating Spacer has never been equaled for protection against shorting between casing and carrier. It is easily installed in the field; features an exclusive rugged design that prevents cold flow or coating damage; serves dependably—even under environmental extremes—throughout its long service life. *Write or phone TODAY for complete information.*

DISTRIBUTOR INQUIRIES INVITED

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MARWAIS MANUFACTURING DIVISION

A DIVISION OF MARWAIS STEEL CO.

New Address: 6466 Gayhart Street • Los Angeles 22 • California
New Telephone: RAymond 3-8831

GAS·PEOPLE

MAX R. LLEWELLYN, manager of Arizona Public Service Co.'s gas and electric operations, was elected a vice president of the Phoenix-based company. He will continue in his present managerial post.

HENRY N. ROBB from property records supervisor to staff assistant (budgets) of the Peoples Natural Gas Co., Pittsburgh.

M. R. Llewellyn
Arizona PSCo.

H. N. Robb
Peoples Nat.

Evan Adams
East Ohio

S. L. Barber
Walworth

install *Lancaster* meter parts for proven quality and performance

Lancaster
VALVE COVERS
Engineered to prevent most common valve problems. Oversize stud provides friction-free contact with index drive flag. Micro-finish lapped surface assures perfect seal. Extra heavy valve shell covers top and sides of carbon-graphite ring for full protection.
Lancaster non-crack
SYNTHETIC DIAPHRAGM
Quality proved in meters from coast to coast. Rolls smooth without wrinkles. Reinforced at all flexing and hinging points. High flexibility and low differential. Installed without changing gear ratio or replacing standard parts. For best performance use our adjustable height oval slot carrier wires for straight line diaphragm movement.

a meter is only as accurate as its parts

Lancaster METER PARTS CO.

Manufacturers of Quality Parts for Gas Meters

POST OFFICE BOX 378 LANCASTER, OHIO

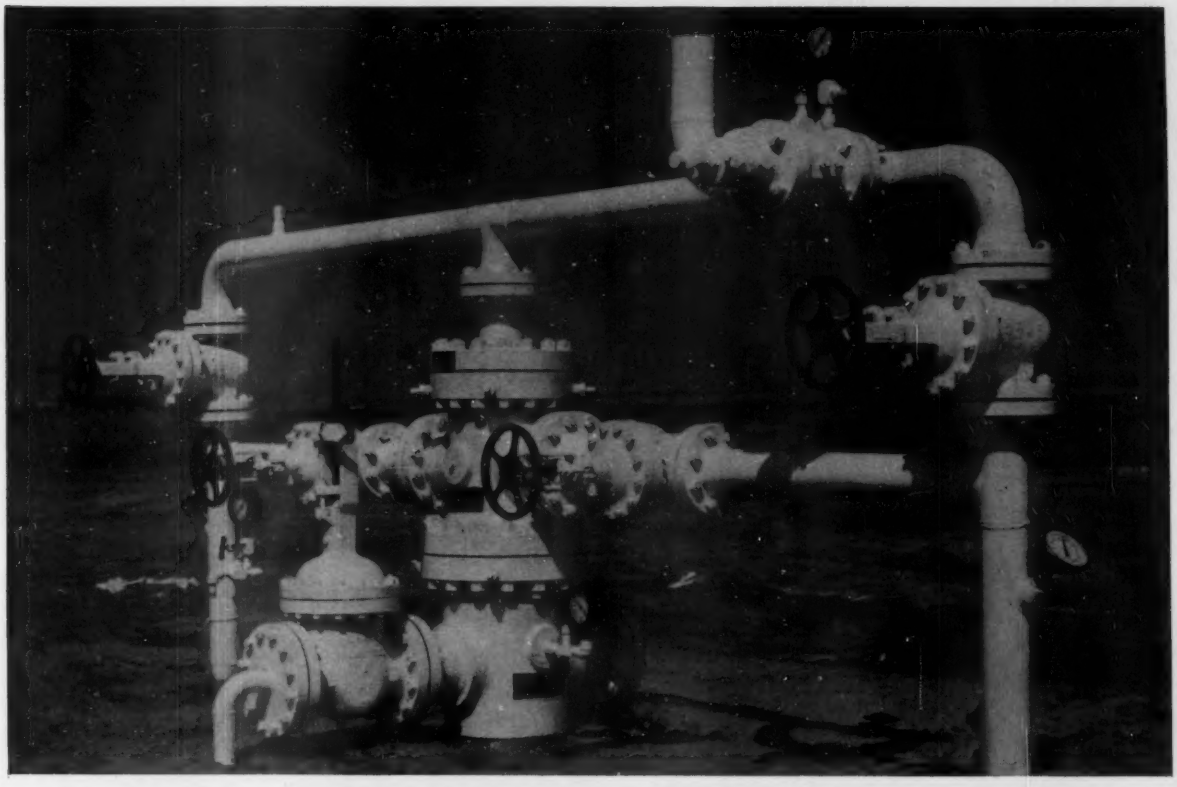
MICHAEL C. MALLOY has been named western division sales manager, lubricated plug valve division, Walworth Co. Malloy headquarters in Houston.

R. S. WICK has been named product service manager for General Electric's two-way radio equipment and other communications lines. WILLIAM TORBICK, formerly district manager at Syracuse, N. Y., was appointed regional manager for mobile communications at Columbus, Ohio. New district sales managers for two-way radio equipment are: RAY C. LINNERTZ, Syracuse; DONALD E. GILLICK, New Rochelle, N. Y., and EUGENE MORRISON, Wellesley, Mass.

S. L. BARBER has been elected a vice president of Walworth Co. and president of the pipe prefabricating subsidiary in Houston, Southwest Fabricating & Welding Co. Barber succeeds A. B. JUDD as president of Southwest. Judd has become chairman of the board.

EVAN D. ADAMS has joined East Ohio Gas Co., Cleveland, as personnel director.

S. L. WINDHAM, formerly general superintendent of pipelines, has been appointed general manager of distribution properties for the Houston Corp., St. Petersburg, Fla. ELDON ROLFE, chief engineer for Houston Texas Gas & Oil Corp., assumes the post of general superintendent of pipelines for Coastal Transmission Corp. and Houston Texas Gas & Oil. JIM HOSS, chief engineer for Coastal Transmission, becomes chief engineer for Houston Texas Gas & Oil as well. TALMADGE DAY, chief accountant for Coastal, assumes the post of internal auditor for the Houston Corp. and its subsidiaries.



FOR STORAGE WELLS TOO!

RECTOR SEAL-WITH-STEEL INSURES SAFETY—PREVENTS LOSS

The underground storage of liquefied petroleum gases is becoming increasingly important in solving the problems of seasonal storage of butane and propane gases.

Of vital importance to underground storage is the surface equipment necessary to insure safety of operation, and to prevent loss through leakage after storage wells are completed.

Rector "RH" casing heads and Rector "ML" tubing heads are ideally suited for storage well completions, and for oil and gas wells. The Rector seal-with-steel feature gives positive metal to metal seal, the trademark of Rector's design and safety. Rector *engineering know-how* is available to solve individual problems presented by varied underground storage installations. Rector equipment meets all standards of the API and the Association of Well Head Equipment Manufacturers. Tested to 22,500 lbs. as stipulated in API test specifications.

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Available as straight Transition fittings or meter risers in pipe sizes (IPS) ⅜", ½", ¾", 1", 1¼" and 1½".

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J. C. ABRAM, rate engineer in the finance and rate department of Southern California Gas Co., Los Angeles, has been named to the new post of executive assistant. He reports to vice president F. M. FOSTER and will be responsible for steam plant and rate and regulatory matters indirectly related to sales. C. T. DIERKER takes over the new post of manager of sales promotion, reporting to general sales manager P. R. Shea. Dierker was general staff supervisor of nonresidential sales. W. A. WILSON becomes manager of divison sales, also reporting to Shea. During the last five years, Wilson has been manager of SoCal's southwest division.

P. D. MILLER, dealer sales manager for Ohio Fuel Gas Co., has been named to the new post of business promotion coordinator for the Columbus, Ohio, company. GORDON W. COLLIER succeeds Miller as dealer sales manager. BERNARD H. KELLOGG, southeastern district business promotion manager, succeeds Collier as central district promotion manager.

JAMES C. SHEEHAN has been named a product line manager at Mine Safety Appliances Co., Pittsburgh.

ANDREW J. SORDONI, JR., president of A. J. Sordoni Construction Co., has been elected a director of the United Gas Improvement Co.

R. J. GRAHAM has been promoted to sales engineer in Cooper-Bessemer Corp.'s Mount Vernon branch sales office of the east-central sales district.

THOMAS I. STACY moves from assistant product manager, pipeline and gas utilities valve sales for Rockwell Manufacturing Co., to manager of the newly created valve actuator products department.

ARTHUR W. FLYNN joined Ebasco Services Inc. as a nuclear engineer.

JOHN A. MALSI named central region resale manager of Worthington Corp., Harrison, N. J.

See this exclusive WHITE 4-MAN CAB during the American Gas Association meeting in Philadelphia.

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One trip—one truck gets equipment and a 4-man crew out on the job. This big, new WHITE offers the most spacious cab in its class. *Specifically* designed for the utilities industries to increase efficiency of operations.

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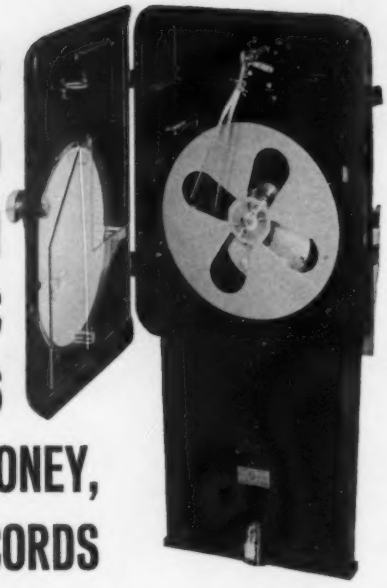

With Dial-O-Graph, you can fully automate your recorders so that they will operate completely unattended . . . day and night . . . for hours, or weeks — with the charts changed automatically. Recorders in an entire plant or system can be synchronized so that the charts change at exactly the same time — an advantage virtually impossible with manual chart-changing. Personnel problems are reduced, recording data is more accurate and reliable, and accounting records are better.

Dial-O-Graph adapts to any make, model, or type of recorder. Any standard circular chart can be used, modified only with a single slot in the center, the same slot pattern for all instruments and all change times. Charts are group-loaded on the chart plate, as many as 50 at a time if desired. Dial-O-Graph charts stack, handle, and integrate as usual.

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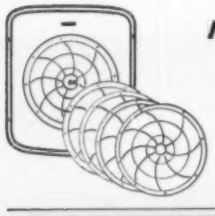
Whether you have one or one hundred recorders, Dial-O-Graph is worth your investigation. Write for illustrated literature and a list of users in your area. There's no obligation, of course.



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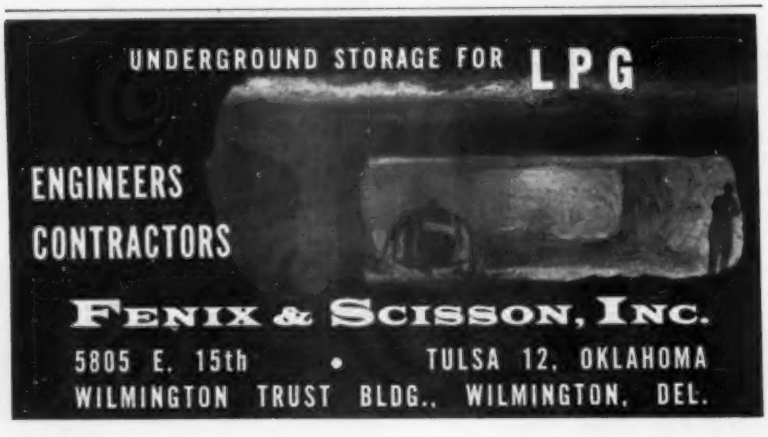

Minneapolis-Honeywell Regulator Co.'s Special Systems division has formed a separate computer department and named SAMUEL D. HARPER as its manager. The new department will be responsible for engineering and marketing programs for integrated industrial process control systems incorporating the Honeywell 290 digital computer.

FRANK P. MACDONALD has been elected president of Electro Rust-Proofing Corp., Belleville, N. J. Macdonald joined ERP in 1939 as a sales representative. In 1947, he was named sales manager.

JAMES W. WALKER has joined Neptune Meter Co.'s Dallas office as a sales representative.

F. P. Macdonald
Electro

S. D. Harper
Honeywell

EDWARD A. WILLIAM, formerly controller of Collins Radio Co.'s Cedar Rapids division, has been elected vice president, operations control of Collins.

CLYDE RICKARD has been named pipeline coating sales representative in the states of Missouri, Illinois, Iowa, the Dakotas, Minnesota and Wisconsin for the Protective Coatings division, Pittsburgh Chemical Co. He headquarters in St. Louis, Mo.

LOUIS P. PISANI has been named a sales representative to cover central and northern California for Neptune Meter Co.

RALPH T. MCELVENNY, president and chief executive officer of Michigan Consolidated Gas Co. and the American Natural Gas Co., has been elected to the board of directors of Parke, Davis & Co.

JACK MERSHON appointed area sales manager for C-B/Southern's Mid-Continent District, headquartering in Tulsa.

JOHN ADAMS THIERRY, vice president, was elected to the board of directors of Bucyrus-Erie Co., South Milwaukee, Wis. MERLIN H. BIRK, controller of the company since 1959, was elected vice president.

HARRY J. SCHMIDT moves from assistant manager, general accounting department, to manager, general accounting department of Philadelphia Gas Works. ROBERT L. BARRETT and WILLIAM W. HENRY were named assistants to the manager of general accounting.

FRANK J. SHRAMEK from chief building engineer to superintendent of building for Lone Star Gas Co.'s system offices.

J. A. Thierry
Bucyrus

M. H. Birk
Bucyrus

GEORGE W. BALDWIN named eastern sales manager of the Geo. D. Roper Sales Corp. He headquarters in Philadelphia.

CHARLES M. HOOVER moves from director of marketing to vice president and director of marketing, Geo. D. Roper Corp., Kankakee, Ill.

J. T. PITTS named sales manager of Minneapolis-Honeywell's Brown Instruments Division. He succeeds J. A. ROBINSON, who joins the company's six-division Industrial Products group to coordinate expanding activities in the metals producing areas.

TAYLOR G. NELSON has joined Titan Valve & Manufacturing Co., Cleveland, as sales manager. Nelson will head Titan's expanding marketing and promotional activities.

JAMES T. SHORE appointed to the newly created post of program manager for industrial gas turbines, Garrett Corp.'s AiResearch Manufacturing Division, Phoenix.

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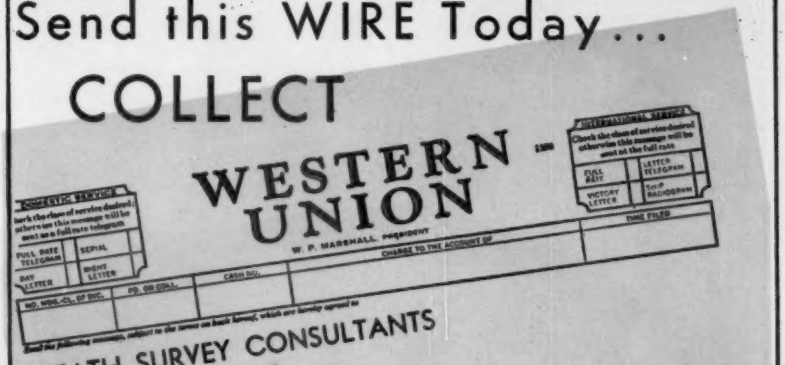

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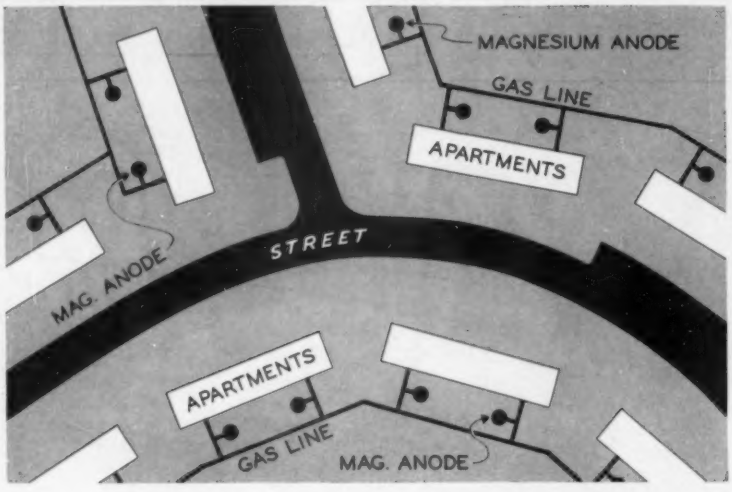

LEAKS IN GAS LINES STOPPED AT HOUSING DEVELOPMENTS

The management of three Ohio housing developments was faced with an increasing number of leaks in the gas lines serving the apartments. External corrosion was found to be the cause, and CSI was awarded a cathodic protection contract on a bid basis.

To stop the corrosion, CSI engineers installed 17-pound magnesium anodes. The anodes project a protective electrical current onto both the 2-inch lines leading into the individual apartments and the larger distribution lines. More than 350 anodes, pre-packaged with backfill in cloth bags, were used. Protection was designed for 10 years.

CSI furnished the anodes plus all necessary labor and equipment—augers, ditchers, etc. Some anodes were installed under concrete and blacktop. In all cases, installations were made to the inspectors' satisfaction.

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DONALD A. HAMILTON, recently transferred from Arkansas Fuel Oil Corp. to Cities Service Gas Co., has been elected assistant treasurer.

The retirement of vice president and treasurer C. EDWARD PEARMAN from Pacific Lighting Gas Supply Co., Los Angeles, resulted in the following promotions in the treasurer's department: ROBERT L. WEIL from auditor to general auditor, ARTHUR W. LOW from chief accountant to supervisor of accounting; and HAROLD T. JOHNSON from administrative aid to assistant treasurer.

Carl Boat
Vermeer

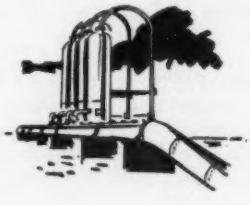
E. B. Carey
Dresser

EDWARD B. CAREY, assistant sales manager, has been named director of marketing for Dresser Manufacturing division of Dresser Industries Inc., Bradford, Pa.

CARL E. BOAT named sales manager of Vermeer Manufacturing Co., Pella, Iowa. He succeeds BILL WILLINGER, who has organized Willinger Bros. Equipment Co. in West Salem, Wis. The new firm sells Vermeer industrial equipment in Minnesota and Wisconsin.

PETER F. GRAD named chief chemical engineer, Rotron Manufacturing Co., Woodstock, N. Y.

JAMES B. HENDERSON, vice president and general counsel, and DONALD RUSSELL, former president of the University of South Carolina, have been elected to the board of directors of Transcontinental Gas Pipe Line Corp., Houston.



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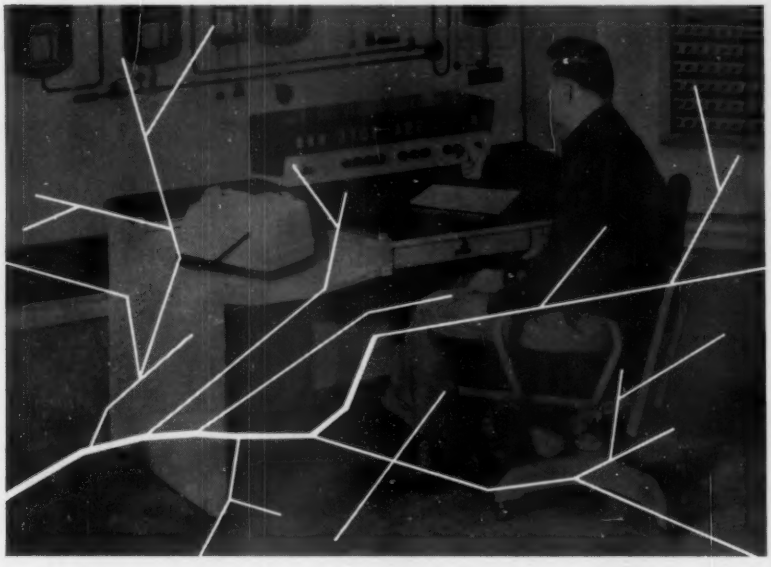

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GENERAL PRODUCTS DIVISION
HAYS MFG. CO.
ERIE, PA.

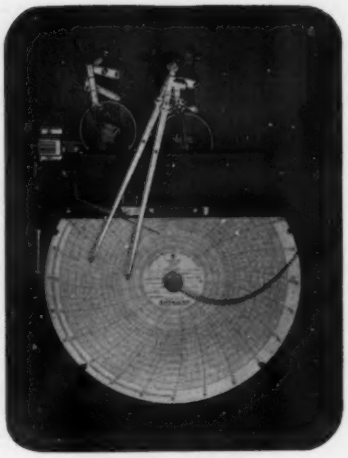
Motorola Communications & Electronics Inc. has appointed four new regional sales managers. They are: CHESTER L. PRINGLE, who moves to Denver from a similar post in west Texas; GLENN A. FROBERG in Indianapolis; IRA WALKER, Memphis; and PAUL E. RUSSUM, Dallas. Denver, Indianapolis, and Memphis are new home cities for the Motorola sales organization.

REMICK MCDOWELL, chairman of the Peoples Gas Light & Coke Co., was elected chairman of the boards of directors of a number of Peoples' subsidiaries, including Natural Gas Pipeline Co. of America, Natural Gas Storage Co. of Illinois, Peoples Production Co., Texoma Production Co., Kimswick Development Co., and Union Hill Gas Storage Co. LESLIE A. BRANDT, president of Peoples Gas, was elected a director of Natural Gas Pipeline, Texoma Production, and Peoples Production. WAYNE SIMPSON was made a vice president of NGPL, Natural Gas Storage and Texoma Production. H. S. CAIN, N. L. MCCLURE, and A. L. SEIDEL were elected assistant comptrollers of the latter three subsidiaries.

L. W. DARLING from general sales manager to director of marketing; C. E. FLORA from manager of industrial sales to general sales manager; and G. B. EDGELL to director of operations—all for Davey Compressor Co., Kent, Ohio.

WILLARD G. WEIGEL, treasurer and vice president in charge of personnel for Lone Star Gas Co., Dallas, has retired after almost 33 years of continuous service. He began his Lone Star career in 1928 as a public relations representative. He became assistant advertising manager at Lone Star in 1932 and advertising manager in 1935. Appointed Lone Star's first director of personnel in 1942, Wiegel assumed the additional post of treasurer in 1950. In 1958 he was elected a vice president.

W. T. EATON has been named manager of Lone Star Gas Co.'s Ranger customer service office, succeeding L. R. CONN, who has resigned. Lone Star also named H. E. LAWSON manager of the Childress district of distribution. He succeeds DOYLE C. MCKINNEY, who transferred to Grand Prairie as district manager. BILLY JOE THOGMARTIN has been named local manager of Lone Star's distribution operations in Wellington.



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WILLIAM A. FINN from vice president and general manager of the Harrison (N. J.) division to vice president-group executive of Worthington Corp. A. EDWIN CARTER, former vice president-manufacturing, succeeds Finn in the Harrison post.

ROBERT E. JOHNSTON JR. named vice president-sales, Fox Steel Pipe Corp., Birmingham, Ala.

C. F. GRUMLEY named corporate director of purchasing and traffic and B. R. GETMAN named manager of purchasing of the Clausen Works —J. I. Case Co., Racine, Wis.

Deaths

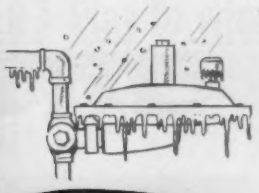
EDWARD S. PLANK, 60, veteran Houston employee of Tennessee Gas Transmission Co., in Lafayette, La., while on a business trip. Plank was superintendent of the gas measurement department of Tennessee Gas Pipe Line Co., TGT subsidiary, and was generally recognized in the industry as an authority on measurement techniques and operations. Formerly with Northern Natural Gas Co., Central States Utilities, Southport Refining Co., and Lone Star Ordnance Corp., Plank joined Tennessee Gas in September 1944.

E. W. MAAS, 62, president and general manager of Kwik-Mix Co., in Port Washington, Wis., following a heart attack. Maas had been president of Kwik-Mix, a division of Koehring Co., since 1948, when he transferred from the Koehring division, Milwaukee. Maas was associated with Koehring for 44 years, joining the company in 1917 as head of its cost department.

MICHAEL J. HARPER, 69, vice president of the meter and valve division of Rockwell Manufacturing Co., in Brooklyn, N. Y., on March 21 after a month's illness. Harper, long-time and well-known gas meter-man, had been in semi-retirement for four years after more than 45 years with Rockwell. Mr. Harper was a member of the AGA, the New Jersey and New England Gas associations, and the Society of Gas Operators.

HENRY A. RUYSSER, JR., 55, executive vice president of Black, Sivalls Bryson, Inc., Kansas City, Mo. In 1946, Mr. Ruysser joined BS&B as vice president and member of the board. In 1955 he was elected executive vice president.

UNIVERSAL



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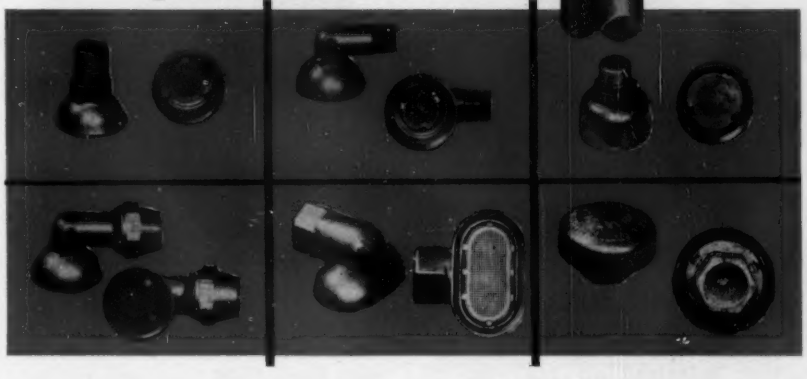

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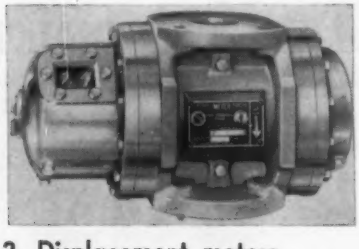
GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 113, 114

1. Lubricator sight

McCord's safe level sight feed for force feed lubricators warns that entrained air can stop oil feeding of the lubricator (GEC-340). Model A32156 acts as an air filter chamber as long as oil level can be seen in the glass. When oil level decreases, it's a warning that there is excessive aeration in the oil.
McCord Corp.

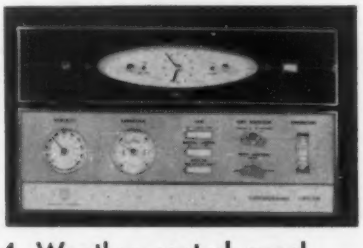


2. Displacement meters

Roots-Connersville has added a 7000 cfh (168 MMcfd) Model 7M125 to its line of rotary positive displacement meters (GEC-560). The new line-mounted Rootsmeters are recommended for production, transmission, distribution, intra-plant or institutional gas measurement at pressures to 125 psi.
Roots-Connersville Blower Div.

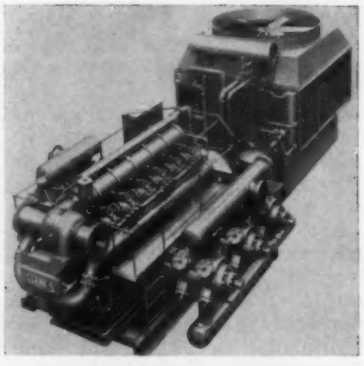
3. Trencher-backfiller

High flotation with maximum traction lets operators of the compact Davis T-66 trencher-backfiller operate in adverse soil and weather conditions (GEC-210). One operator reports that he was able to travel over and dig beside a pre-existing 6-in. drain tile buried under 8 in. of ground without damaging the buried tile.
Davis Mfg Inc.



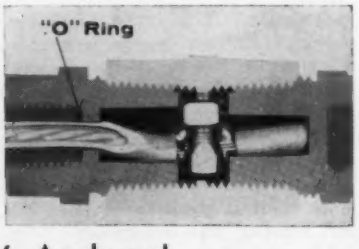
4. Weather control panel

General Controls' Thermoramic Center offers indoor weather data and control plus information on outdoor weather (GEC-190). The panel has a monitor system which indicates clogged air conditioning filters, extinguished gas pilot light, or improperly functioning compressor.
General Controls Co.



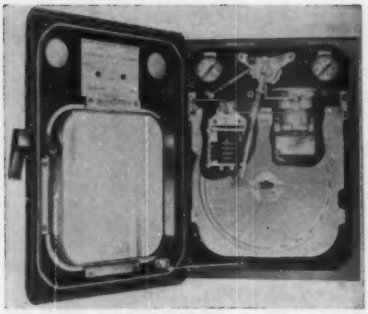
5. Packaged compressors

Clark Bros. new packaged field compressors provide up to 1000 bhp (GEC-160). They are mounted on a single skid 35 ft long, complete with radiator, scrubber, and accessories. The heavy-duty VeePacs are 2-cycle, turbocharged, integral gas engine-driven units. They are suitable for small diameter gas transmissions lines.
Clark Bros. Co.



6. Anode seal

A moisture-proof, fool-proof seal for protecting wire connections to magnesium anodes is available from Western Plastics (GEC-110). With "Slipcap," special tools, putty or plastic tape are not needed to make a completely moisture tight protective seal.
Western Plastics Co.

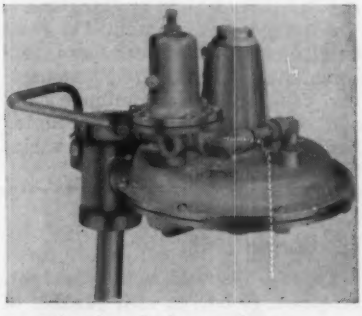


7. Pneumatic controller

Bristol has a new recording pneumatic controller (GEC-750). Series 532 offers good frequency response (essentially flat to over 300 cycles per min.), low air consumption (less than 0.1 scfm), high exhausting capacity (over 3 scfm at 1 psi drop), high tolerance to shock, and high temperature stability. Key to performance is the new A/D control unit.
Bristol Co.

8. Mobile telephone

AC Spark Plug division is producing a new mobile telephone system for automobiles (GEC-140). Called AChieverfone, the system provides means of placing or receiving telephone calls in automobiles by radio through the public land line telephone system. The telephone has been designed and packaged into two compact units: the control head and the receiver-transmitter unit.
AC Spark Plug



9. Pilot-loaded regulator

Rockwell has a package unit that provides precise regulation at outlet pressures and capacities in excess of those controlled by a standard high pressure regulator (GEC-700). The new unit combines a cast iron "173" high pressure regulator assembly and standard diaphragm with an 080R pilot. Operating range: 10 to 100 psi gauge inlet pressure, 2 to 20 psi gauge outlet pressure.
Rockwell Manufacturing Co.

10. Natural gas carburetor

A new natural gas carburetor preset to the engine's true power curve is available from Imperial Machine (GEC-100). Designed specifically for engines operating on natural, manufactured, or LP gas as a standy fuel. The carburetor operates directly from an ounce regulator on natural gas with no final stage of regulation or from an atmospheric regulator on LPG.
Imperial Machine Products

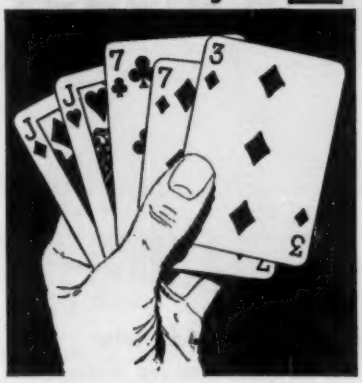
11. Compressor

Worthington's new balanced-opposed compressor for high speed operation is especially adaptable to gas and oil field operations (GEC-160). The CUB (for compressor unitized and balanced) is designed for field uses involving semi-portable compressor units of between 200 and 350 hp. The 5-in. stroke, 1000-rpm, 2-cylinder unit is for direct coupling to a high speed gas engine.
Worthington Corp.

12. Frequency standards

Motorola's two new all-transistorized frequency standards are for varied applications requiring extremely high stability frequency sources (GEC-140). One unit is portable, weighing less than 7 lb. It maintains frequency stability of 1 part in 1 billion per day. The other, a laboratory unit, provides automatically corrected output signals stable to plus or minus 2 parts in 1 billion.
Motorola Inc.

POKER? Play to win!



How would you play this hand?

Not strong, but play it. Two times in three you'll be high hand before the draw. Raise to drive out pairs. Then stand pat. It's 12 to 1 you couldn't fill anyhow, and it helps set up later, better hands.

Here's a sure winner from FORD:

New Ford 4000 Heavy Duty Fork Lift! Strength, stability and big-tire traction for fast, safe materials handling on rough terrain.

4000 lbs. rated load at 24" load center. Conforms to or exceeds all Fork Lift Industry stability and capacity recommendations.

Five basic models with 10' to 21' lift heights. Two and three-stage telescoping masts with unusually low collapsed heights. Especially built for rough terrain. Its mobility and low collapsed mast height adapt it for work in many areas with low doorways and narrow aisles.

Get details from your Ford Tractor Dealer, or write:

Tractor and Implement Division
Ford Motor Company
Birmingham, Michigan

Ford
TRACTORS
EQUIPMENT

GAS DIGEST

13. Fuel-demand meter

A new fuel-demand meter measures requirements for both heating and hot water needs (GEC-540). Two electronic tabulators provide the information. Customers using fuel for heat only are delivered according to the left tabulator using the new Johnson system that records all factors entering into fuel demand — wind, sun, rain, snow, as well as temperature. Customers using fuel for hot water also are delivered according to the right hand tabulator, which automatically adds such needs to the degree days.
Johnson Degree Day System

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in a TRENCHER

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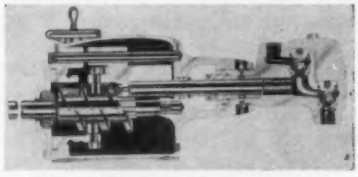
AUBURN MACHINE WORKS, INC.
2855 South J Street, Auburn, Nebraska, U.S.A.
Phone: BRidge 4-3141

14. Audio-tone signalling

Quindar is producing a line of transistorized audio tone equipment and accessories (GEC-750). Included: a single type of plug-in transistor for both AM and FS units; 12-v d.c. or 117-v a.c. operation; 1 to 3 channels in 1-3/4-in. x 19-in. rack space or 1 to 11 channels in 5¼-in. Also featured is complete interchangeability of AM and FS transmitters and receivers.
Quindar Electronics Inc.



15. Proportioning pump

American Meter is introducing its Series 300 proportioning pump (GEC-660). Pump capacity can be adjusted while the pump is running. It features a control mechanism in which the output of two cams is combined to vary the stroke of zero to maximum. Simplex model has capacities from 1 to 810 gal. per hour; duplex capacities range from 2 to 1624 gal. per hour.
American Meter Co.

16. UHF tubes

Two new, very small conduction-cooled UHF Cermolox tubes from RCA can be used in mobile and fixed communications equipment (GEC-140). The new tubes fit a variety of applications where small size and compactness of equipment are of utmost importance.
Radio Corp. of America

17. Special body trucks

Wheels Inc. has announced a new plan under which special - body trucks used in the gas industry can be leased without maintenance for from four to eight years (GEC-790). The long-term leasing is termed an innovation for special-body, over-the-road equipment used by gas producers, utilities, and LPG distributors.
Wheels Inc.

18. Epoxy coating

Manufacturing is underway on a new protective coating that can be sprayed, rolled or brushed onto any type of surface under all weather conditions (GEC - 610). PlastXcoat, suitable for natural gas lines, has been tested in temperatures ranging from —73 deg F to 250 deg F.
Bradco Plastics Inc.

TRADE LITERATURE

19. Meter swivels and nuts

A two-page bulletin, No. 300-2, describes Eclipse Fuel's line of "Certified" meter swivels and meter nuts GEC-370). The bulletin pictures offset, adapter and straight meter swivels, and meter nuts, and illustrates three typical installations.
Eclipse Fuel Engineering Co.

20. Two-way radio

General Electric's new Pacer line of compact, economy two-way radio equipment is described in Bulletin ECR-870 (GEC-140). Included are battery drain charts, installation information, and other equipment details.
General Electric Co.

21. Pressure regulators

Specifications on Reliance Type HPC pressure regulators for reducing applications are covered in Bulletin 123 from American Meter (GEC-700).
American Meter Co.

22. Totalizing flow

The B-I-F Shuntflo meter for measuring steam, air or gas in lines 1 in. and larger, is described in Bulletin 400.20-1 (GEC-560). The 4-page, two color bulletin gives details on specifications, and features the new pressure-compensating counter, which automatically and continuously corrects counter readings for line pressure variations.
B-I-F Industries Inc.

23. Boring unit

The Ka-Mo-A-20, a light weight, air-powered boring unit capable of augering 2¼- to 16-in. diameters, is covered in a new bulletin (GEC-210). Included are illustrations and a capacity chart.
Kwik-Mix Co.

24. Metal buildings

A new illustrated catalog, BD-660, describes a complete line of permanent, pre-engineered metal buildings (GEC-060). The 16-page catalog covers each of four principal types of Parkersburg buildings.
Parkersburg Rig & Reel Co.

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25. Waste heat recovery

A 24-page bulletin deals with the field of recovery of wasted heat from internal combustion engines as a fuel cost savings (GEC-340). Schematic layouts illustrate many applications, including utility plant.
J. B. Beaird Co.

26. Hinged closure

Tube Turns has made changes to improve product features and provide greater design uniformity in its line of quick-opening hinged closures for blanking off pipeline ends (GEC-370). A new brochure, TT-1034, describes and illustrates the design changes.
Tube Turns Div.

27. Steel-making movie

An "eight - in - one" 35 - minute, color motion picture on steel making has been produced by Youngstown Sheet & Tube Co. (GEC-550). The 8-in-1 term refers to eight specialized endings that can be attached to the main body of the picture. Endings covered include standard pipe, oil country goods, and line pipe.
Youngstown Sheet & Tube

28. Packaged compressors

Operational and design features of Clark's new Model TVM VeePac packaged compressors are presented in a new bulletin (GEC-160). Bulletin 191 describes the compressors as 2-cycle, turbocharged, gas-engine-driven units with V-type engines and horizontally opposed compressor cylinders.
Clark Bros. Co.

29. Recorder, controller

Specification sheets covering Minneapolis - Honeywell's new advanced line of ElectroniK 17 recorders and controllers are available (GEC-750). Recorders included: S 172-1, circular chart; S 173-1, strip chart; and S 176-1, circular scale indicator. Controllers include: S 172-2, circular chart; S 173-2, strip chart; and S 176-2, indicator controller.
Minneapolis-Honeywell

30. Pressure regulators

American Meter gives details on four Type HPR pressure regulators in Bulletin 120 (GEC-700). The regulators, designed for reducing, relief, and back pressure applications, are available with

Problem

Remove oil and casing head drip ENTRAINMENT from 4" feed line.

Solution

Hi-eF GAS SCRUBBER To eliminate burner problems in stress relieving and normalizing furnaces. A Type L 4-150 Hi-eF Line Scrubber was installed in 4" feed line from storage well replacing baffle-type scrubber.

Results

Handling 1.5 MMSCFD of natural gas at 60 PSIG this unique two stage scrubber, with no moving parts, removed approximately 30 gals. of liquid entrainment per month.

More Information

Write for Bulletin 601 or ask for an Anderson engineer to call.

Hi-eF PURIFIER

By the Manufacturers of Super-Silvertop Steam Traps

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Division of International Basic Economy Corporation

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maximum inlet pressures to 200 psi and maximum outlet pressures to 350 psi.
American Meter Co.

31. Instrument pens

Two automatic ink-feed systems for industrial systems are covered in a bulletin from Write-Right Co. (GEC-750). Both the capillary and the bladder feed systems employ a common nib of a universal type. The pens may be mounted on the pen arms of most instruments without modifications to the arm itself.
Write-Right Co.

32. Compressor

Clark's two - cycle gas - engine driven compressors, the TCV, is described in a new bulletin (GEC-160). The new machines offer huge blocks of horsepower in the smallest possible space. Turbo-charged V-engine models with 12 or 16 power cylinders are rated at 4000 and 5000 bph, respectively.
Clark Bros. Co.

corrosion •

Continued from page 21

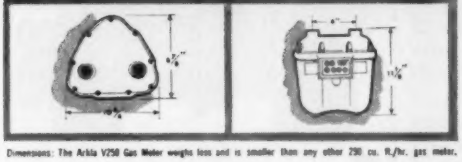
indicative of coating deterioration; while an abrupt drop usually means either equipment or power failure, or the sudden connection of a parasitic load. Two advantages will accrue from frequent readings; first, protection will be restored with a minimum loss of time; and secondly, troubles are usually easier to locate when spotted early, since often their cause can be attributed to some known recent event.

For a gas transmission system, a variation of the above instrument can be had at a considerable saving, particularly if the system is insulated at meter houses from unprotected distribution systems. All that is required is a low-resistance voltmeter connected across the insulated joint, reading the difference in potential between the protected and unprotected lines. The meter can be mounted in the house, and can be read by the man who attends to the meters and charts. The corrosion engineer will have to work out the actual meaning of the readings, but this is not at all difficult. In lieu of an unprotected distribution system, a nearby water pipe can often be used. ■

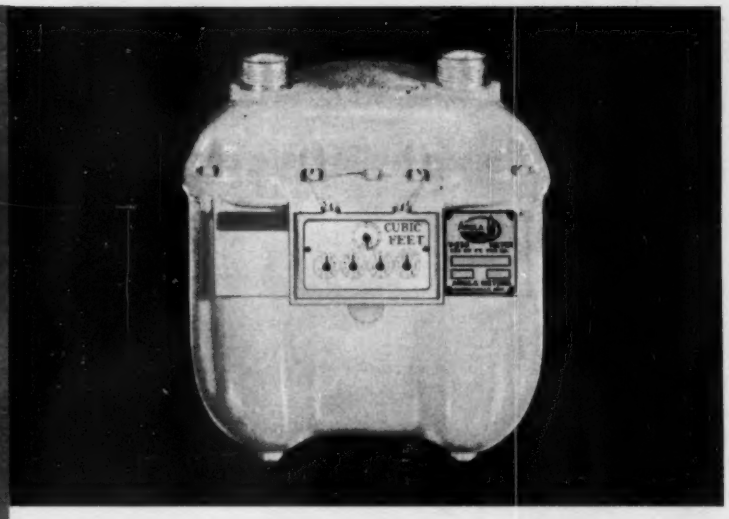
THE ARKLA

V 250

GAS METER



Dimensions: The Arkla V250 Gas Meter weighs less and is smaller than any other 250 cu. ft./hr. gas meter.



LIGHT WEIGHT, compact, the Arkla V250 Gas Meter is easy to install . . . Fewer moving parts reduce maintenance. . . . An accurate new "cash register" for gas measurement.

ORDER TODAY, from us or Arkla-Reynolds Gas Regulator representatives.

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A LEAK IN THE DIKE

Southern Cross Corp.—like the little Dutch boy, keeps "its finger in the dike" for the gas distribution industry. Like a leak in the dike, without attention unaccounted for grows and grows. Our "Contract Leakage Control Service," both survey and repair, can supply expert help as you need it . . . when you need it without costly build-up of personnel and equipment. For complete information about SCC Leakage Control Service, call collect.

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GAS ASSOCIATIONS

Diversification key to distribution conference

Speakers and discussion leaders during AGA's May 8-12 distribution and production conference in Philadelphia will total 169. Meeting place is the Sheraton hotel.

General sessions will be held in the morning while in the afternoon smaller meetings of more technical interest have been arranged.

On Tuesday afternoon there will be an automotive and mobile equipment display at Philadelphia International Airport.

Other specialized sessions include customer service, distribution design and development; metering; corrosion, construction and maintenance; chemical and engineering and production methods.

SGA returns to New Orleans

Variety is the keyword for Southern Gas Association's 53rd annual convention in New Orleans, April 24-26, with subjects ranging from "Gas Turbines—The New Look in Air Conditioning and Power Generation" to "Meteorology Looks Up."

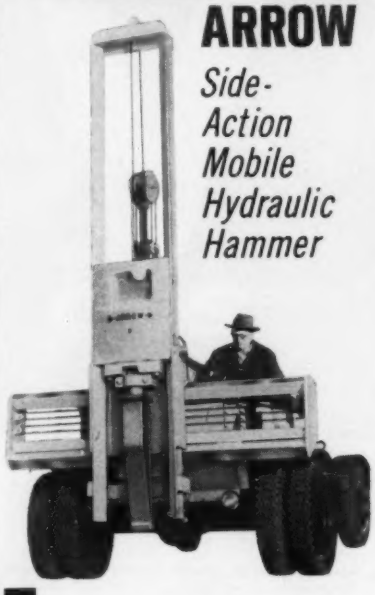
Speakers scheduled for general sessions at the Roosevelt and Jung hotels in New Orleans include Richard Harkness, NBC Washington commentator and news analyst; SGA President James A. Wilson, AGA President Lester T. Potter, and AGA managing director C. S. Stackpole.

Section program speakers include Dr. Willis M. Tate, president of Southern Methodist University; James F. Oates Jr., president, Equitable Life Assurance Society; Dr. Martin Goland, president, Southwest Research Institute; P. V. Mullins, general manager of helium operations for the U. S. Department of Interior's Bureau of Mines.

Convention exhibits highlight new developments in the industry, including several gas turbines, a wall furnace that uses thermo-electricity to operate a circulating fan

NEW ADVANCED DESIGN ARROW

Side-Action Mobile Hydraulic Hammer



With the new ARROW you get these important advanced design features for faster, lower-cost tamping, breaking and cutting:

- Two new side-action models—G400 and D500
- Choice of gasoline or diesel engine
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- Increased creeper power—infinitely variable speed control
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- New, heavier steering axle and wider tire tread
- New, built-in oil cooler
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- New safety devices give added protection to operator and machine
- New, improved, adjustable seat
- Superior maneuverability—shorter turning radius
- New throttle controls

For complete information about the new ARROW Side-Action Hammer and its money-making features, WRITE TODAY!

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and blower, a fuel cell prototype, several items developed by United Gas Instruments division, an epoxy-joined line pipe display, a gas-fired infra-red residential space heaters, and other new developments.

Corrosion short course readied for June 6-8

Increased demand for information on the 6th annual Appalachian Underground Corrosion Short Course has prompted early publication of the program. The three-day school will be held June 6-8 at West Virginia University's School of Mines in Morgantown.

Both technical and non-technical presentations are made of the practical and theoretical aspects of the causes of corrosion. Instrumentation, corrosion surveys, cathodic protection, pipe coatings, and miscellaneous methods of corrosion prevention are covered.

In addition to classroom lectures and demonstrations, more than 50 displays of manufacturers and suppliers will be on view.

Additional information on the course is available from R. E. Hanna Jr., West Virginia University, School of Mines, Morgantown.

NGAA elects Lents; Diehl honored

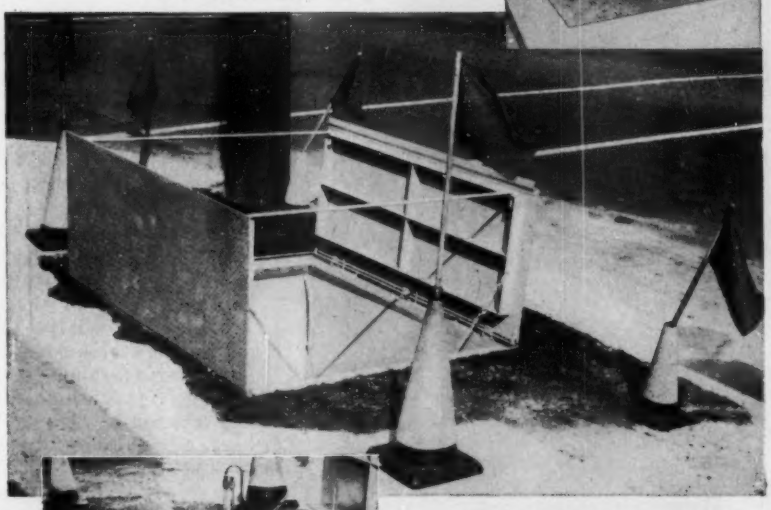
Max R. Lents, vice president and general manager of the Reef Corp., Houston, will serve the Natural Gasoline Association of America as president for 1961-62.

Vice presidents are: G. W. McCullough, Phillips Petroleum Co., Bartlesville; K. G. Pearce, Tenneco Oil Co., Houston; Albert Taylor, Amerada Petroleum Corp., Tulsa; and Dr. C. T. Wells Jr., Goliad Corp., Houston.

John C. Diehl, retired chairman of the board of American Meter Co., was presented the Hanlon Award, highest honor in the gas processing industry and one of the ranking awards of the petroleum industry.

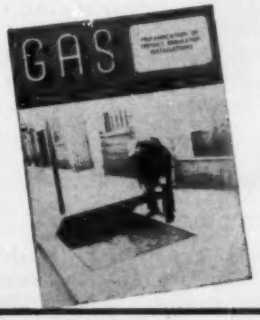
The citation that accompanied the award read in part: "This man has made many significant contributions to our industry as an individual. He not only made many discoveries of great value, but he recognized industry need for them and he had the ability to explain his ideas in written texts so that they could be applied in the field. A whole generation of gas measure-

easiest access to regulators under-the-sidewalk



SPRING-BALANCED BILCO DOORS ARE EASY-TO-OPEN AND COMPLETELY WEATHERTIGHT

Bilco vault doors are the safe choice for gas regulator vaults underfoot. More and more gas companies are finding that Bilco doors wear better, keep water out. When opened they provide maximum ventilation for service men's safety. Built-in drainage and easy maintenance add up to another Bilco bonus—and every Bilco door swings open easily because it's *spring-balanced!*



Send coupon today for FREE copy of article in Gas Magazine, entitled: "Standardization and Prefabrication of District Regulator Installations."

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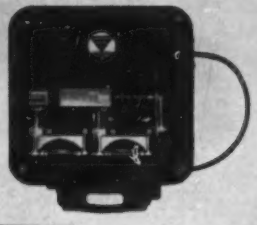

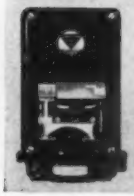

USE AMERICAN® BASE VOLUME AND BASE PRESSURE INDEXES

American BASE VOLUME INDEXES register gas quantity at standard conditions of base temperature and base pressure. BASE PRESSURE INDEXES automatically multiply volume at line conditions by the pressure factor and indicate quantity at base pressure on a straight reading index.

No computations...accurate gas volumes at base conditions are shown immediately. A second counter on the back indicates volume at line conditions. Simple operating principle... integration is continuous with all functions performed mechanically through special gearing.

Write for Bulletins 200 and 201.

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ment men, the gas industry and the gas processing industry owe this man a vote of thanks and gratitude for his monumental aid in making their operations easier and much more accurate."

Transmission men gather in Denver

Communications, tele-control, gas dispatching, gas measurement, transmission, and underground storage all will be covered during the May 25-26 AGA transmission conference. Denver's Brown Palace and Cosmopolitan hotels serve as conference headquarters.

General sessions will be held on Thursday and Friday mornings. S. A. Bradfield, chairman of the transmission committee, will preside at Thursday's general session. Subjects to be covered: computer committee progress report, the integration of automation in the gas industry, pipeline research, gas measurement, and gimmicks and gadgets.

Friday's general session, presided over by G. C. Grow Jr., chairman of the committee on underground storage, will feature underground storage statistics, Russia's oil and gas business, pipeline engineering by photogrammetry, cavern storage of natural gas in an abandoned coal mine, and a review of aquifier storage.

Thursday afternoon sessions cover communications, compressor stations, gas dispatching, gas measurement, and pipelines. Friday's afternoon sessions cover compressor stations, pipelines, and underground storage.

Fred Ebdon, editor of GAS magazine, will speak on "Today's Challenge to Gas Measurement Personnel" during the Thursday measurement session.

Dalbeck heads NEGA for coming year

Harold L. Dalbeck, president, Gas Companies of New England Electric System, Malden, Mass., was named president of the New England Gas Association at the group's recent annual meeting.

Serving with Dalbeck are: 1st vice president, J. F. Rich, president, New England Gas & Electric Association, Cambridge, Mass.; 2nd vice president, G. T. Henry, president, Providence (R. I.) Gas Co.; treasurer, B. A. Johnson, trea-

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surer, New England Gas & Electric Association, Cambridge. Clark Belden, managing director of NEGA, is serving as clerk.

Meter group sets up student aid fund

Southern California Meter Association has set up a loan fund to aid engineering students at California State Polytechnic College.

Available for students at the Pomona, Calif., campus of Cal Poly, the fund has initial assets of $750, according to SCMA president J. Marvin Lange.

The fund has been established, Lange said, "to enable young men and women at Cal Poly to continue their education when, for financial reasons they might otherwise have to leave school." It will be available as either short-term loans for those experiencing temporary financial need or as larger loans enabling students to finance their education.

Mid-west leaders

These men are now guiding the Mid-West Gas Association, which now numbers 650 members in 12 states. Elected at the group's 56th annual convention (Omaha, late March) were: seated, left, President C. J. Math of Iowa-Illinois Gas & Electric Co.; seated, right, First Vice President K. W. Person, Minneapolis Gas Co.; standing, left, Second Vice President A. D. Schmidt; and standing, right, the reelected Secretary-Treasurer, J. J. Finnegan, Northern Natural Gas Co. Newly elected directors, not shown, are: H. A. Diekmann, Northern Illinois Gas Co.; G. E. Bonacker, Central Electric & Gas Co.; Dale TeKolste, Peoples Natural Gas; and Tom Johnson, Caloric Appliance Corp. News coverage of the session is on page 90.

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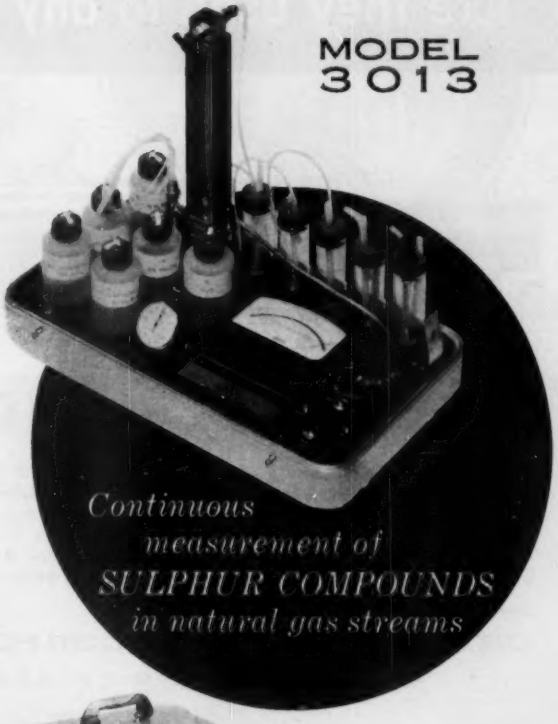

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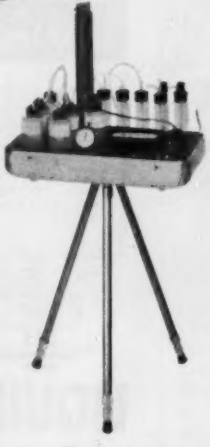

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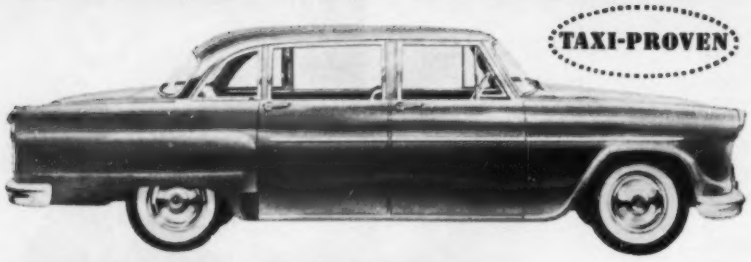

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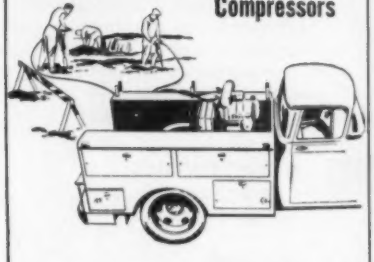

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Current reading

DESIGN FACTORS OF GAS APPLIANCES FOR MORE EFFECTIVE USE OF HEAT EXCHANGER SURFACES—AGA Research Bulletin 86 describes heat transfer studies made with tubular-shaped and sectional-type gas-fired furnace heat exchangers. While the research was focused on improvement of gas furnace heat exchangers, the results will be helpful in designing other types of appliances as well. Copies are available from AGA Labs, 1032 E. 62nd St., Cleveland 3, or AGA headquarters, 420 Lexington Ave., New York. Price: $2.50.

PRECISION MEASUREMENT AND CALIBRATION — National Bureau of Standards' Handbook 77 is a compilation of the more important NBS publications over a period of years dealing with precision measurement and the calibration of standards. The handbook divides the subjects in the fields of precision measurement and calibration into three separate volumes: I, Electricity and Electronics; II, Heat and Mechanics; and III, Optics, Metrology, and Radiation. This new compilation is intended to serve as a quick reference source for workers in the field of standards, and also as a textbook and aid to scientists and engineers in standards laboratories. Volume I, Electricity and Electronics, 845 pp, $6; Volume II, Heat and Mechanics, 965 pages; $6.75; Volume III, Optics, Metrology, and Radiation, 1025 pages, $7. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

RESEARCH HIGHLIGHTS OF THE NATIONAL BUREAU OF STANDARDS—An illustrated account of the National Bureau of Standards research and measurement activities in fiscal year 1960 is presented in compact, digest form. Some 225 programs in 18 different fields are described. Annual Report 1960, NBS Miscellaneous Publication 237, 189 pages, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price: 65 cents.

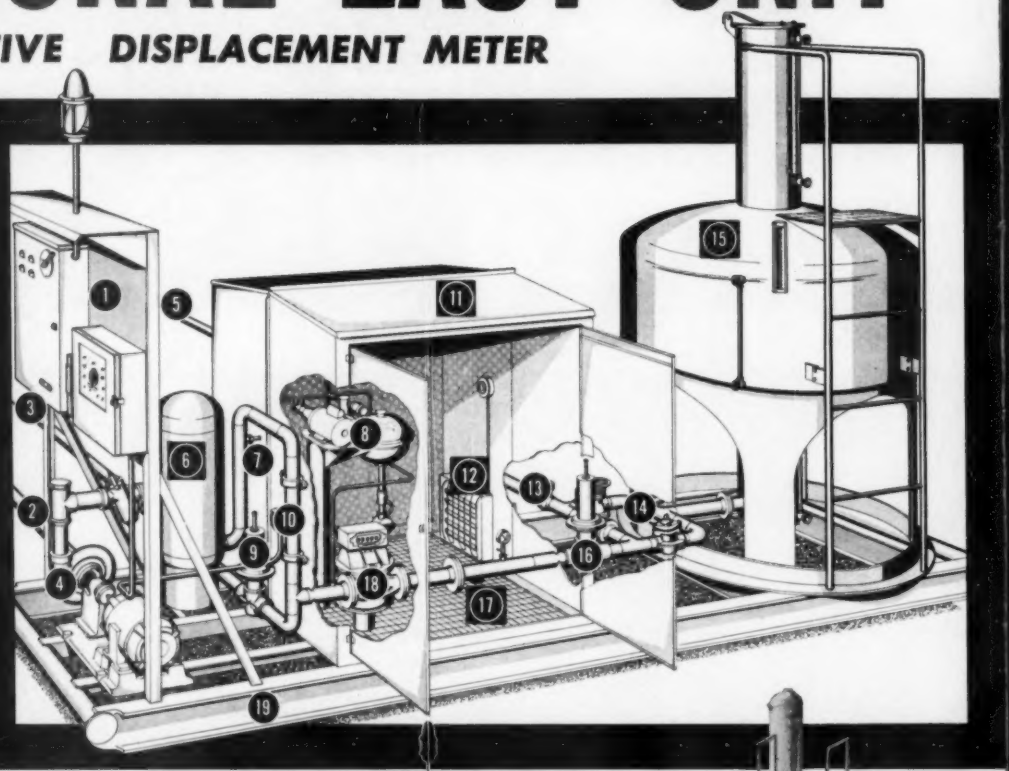
GAS

PIPELINE SECTION

El Paso Natural Gas Company

NATIONAL® LACT UNIT

WITH POSITIVE DISPLACEMENT METER



1. Skid mounted control rack with control panel, B S & W Monitor, power transformer and rotating beacon
2. LACT inlet
3. Rejected oil outlet
4. Transfer pump and motor
5. Pipeline delivery
6. Air eliminator
7. Sample probe
8. Sampler with container
9. Combination bad oil back pressure valve
10. Monitor probe
11. Galvanized meter house
12. Electric thermostat and explosion-proof heater
13. Pipeline check valve
14. Meter prover loop with double sealing gate valve in main line
15. API meter prover
16. Combination good oil and back pressure valve
17. Skid-proof flooring
18. PD meter with automatic temperature compensation and counter-printer
19. 6" I beam skids

○ Indicates optional equipment. Other components furnished in basic LACT unit.

The National LACT Unit with Positive Displacement Meter is designed to meet the requirements of both producers and pipelines. Only four connections required to place this unit in operation:

1. LACT Inlet Line
2. Pipeline Delivery Line
3. Rejected Oil Line
4. Electric Power Input

UNIT OPERATION:

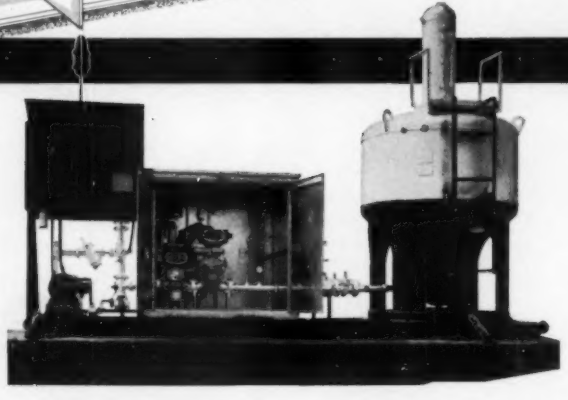
1. Oil from storage is pumped past a B S & W Monitor Probe. If fluid does not meet pipeline specifications, it is re-routed to the Treater or Wet Oil Storage.
2. Pipeline quality oil is metered by the Positive Displacement Meter with automatic temperature compensation. Proportionate samples are taken during delivery.
3. Back pressure and shut off valve insures accurate meter operation and positive control.

National PD/LACT units have been in constant service for over four years. They are now in operation in every major oil producing state and serving most major producers and pipelines.

Since LACT involves both the Producer *and* the Pipeline, it is much more than just a piece of production equipment. LACT is the final important link between the wellhead and the pipeline — a component in a complex system that can control the operation of the entire lease.

Varied lease producing characteristics may be accommodated from one standard arrangement by combining in-stock accessories to meet requirements while maintaining uniformity in design.

All acceptable brands of meters are available from National with stock delivery on some and trained service available on all.



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A PLUS VALUE WITH ALL NATIONAL PRODUCTS . . . Engineers and field crews living in your area with 55 stocked warehouses, complete units or parts ready to size, install and service National PD/LACT Units.

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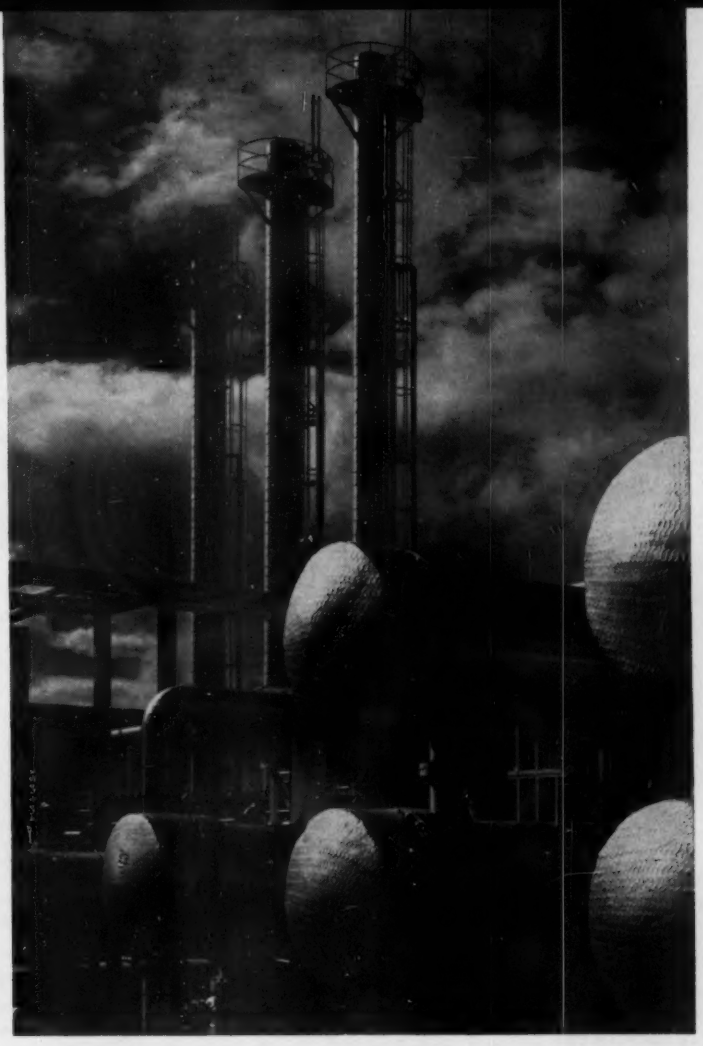

Absorption columns tower above heat exchangers at El Paso's San Juan natural gasoline plant—only one of 10 such plants operated by EPNG.

El Paso Natural Gas Company

By J. FRED EBDON • Editor

The story of growth with service

THE United States has been blessed with fantastic natural energy reserves. However, existence of energy resources realistically means nothing. Other political and geographical areas have substantial natural energy resources, yet have done little to develop their potential.

Intelligent utilization of energy resources sprung this land of ours from an agrarian economy to a leading producer of goods. Energy availability was as important as any other factor in building the United States into a world power and a possessor of a standard of living that all but the most dedicated detractors readily concede is an envy of peoples throughout the world.

Natural gas is one of our energy resources. But, natural gas resting latent in reservoirs added nothing to this nation's progress. In fact, it could be held underground for the next million years and still not benefit this country.

Developing the potential of natural gas reserves is the business of gasmen. Pioneering gas industry people had to learn how to find this resource. They then had to develop methods for bringing it to the surface efficiently.

Equally talented pioneers had to develop techniques for movement of natural gas from points of production to markets. As natural gas became available, through efforts of man, the energy developed

"The Lord put the gas in the ground in hidden recesses scattered over the nation, but it is up to management to get it to the consumer"—Paul Kayser

PIPELINE IN OPERATION
PIPELINE APPLIED FOR
EXISTING COMPRESSOR ST.
COMPRESSOR STATIONS APPLIED FOR.
MAJOR GAS AND GAS AND OIL POOLS
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LOS ANGELES
KANSAS
HUGOTON FIELD
MO.
NEW MEXICO
ALBUQUERQUE
PHOENIX
OKLAHOMA
TEXAS
DALLAS
MEXICO

EPNG's system, extending to California in the West, down into Mexico, and as far north as Canada. Also shown are the California systems of Pacific Lighting Corp. and PG&E and Colorado Interstate's lines through Colorado, Kansas, and Wyoming.

markets. For energy has to be available first for an orderly development of domestic, commercial and industrial progress on a permanent basis.

THE PREFACE TO GROWTH

A pioneer in translating natural gas resources from pools of potential into utilizable energy is El Paso Natural Gas Co. This company was organized on Oct. 18, 1928, to profitably supply natural gas to homes, commerce and industry in the city from which it takes its name—El Paso, Texas.

While the name lingers on, the company has grown and branched out. It currently is a major supplier of natural gas energy throughout the West.

El Paso Natural's first gas pipeline started in an early gas field near Jal, in Lea county, N. M. and stretched over a rugged 200 miles to the then (1928-29) quite quiet city of El Paso. That Jal-El Paso 16-in. pipeline was one of the first all-welded steel pipelines for transporting natural gas.

From that gas-industry landmark, this strong and fine Texas-based El Paso Natural Gas Co. has extended its transmission system to the Pacific ocean in the west; slightly across the border into Mexico on the south; and to the Canadian border to the north. Eastwardly, El Paso Natural Gas' facilities extend into west Texas, southwest Texas, and the Texas panhandle.

Three major EPNG mainline gas transmission complexes cover the West. In concert, these three pipeline systems give El Paso Natural Gas Co. a daily delivery capacity of 3,495,000 Mcf of natural gas at 14.9 psia. Additionally, some 200,000 Mcf per day of interstate and field sales can be handled by existing system.

THE EPNG MARKETS

Prime market for this massive flow of energy is within the state of California. In that state, Southern Counties Gas Co., Southern California Gas Co., and Pacific Lighting Gas Supply Co.—all operating subsidiaries of Pacific Lighting Corp.—currently are delivered 1,130,000 Mcf per day by El Paso Natural for resale in the fabulous, and prized, Los Angeles and southern California market. Thus, the southern California customers of Pacific Lighting Corp. exhibit the heaviest demand on the EPNG system.

Another large customer is Pacific Gas & Electric Co., which serves San Francisco and the rest of northern California. El Paso Natural delivers PG & E some 1,025,000 Mcf per day.

With such dynamic markets for gas connected to it, one might assume that EPNG is not interested in other customers. Just the opposite is true. Management of El Paso Natural maintains a policy that all communities within economic reach of its pipelines will be served by the company. Hence, in addition to its California customers, EPNG has 108 other customers in Arizona, Colorado, Idaho, Nevada, New Mexico, Oregon, west Texas, Utah, Wyoming and Washington. Fully 60 of these customers are gas utilities and municipal gas systems which resell gas to ultimate consumers. Remaining customers fall into the direct industrial sale classification.

Thus, in the Southwest, to the Pacific coast, and in the Pacific Northwest, natural gas delivered by El Paso Natural Gas brings the convenience, economy and modernity of that fuel-energy into homes sheltering 9 million people. But, that is not all of the story.

Today, as this is read, a copper smelter in Cananea, Old Mexico is operating with El Paso Natural delivered gas energy. Up in Washington, salmon is being cooked in the can by natural gas transmitted through the El Paso Natural system. In California, electronics manufacturers producing highly sophisticated components and systems; and missile and rocket manufacturers whose products are now probing outer space, and which are so vital to our defense posture—these very crucial industries get energy from natural gas delivered to that state through El Paso Natural Gas Co. pipelines.

A MIGHTY GAS-MOVING SYSTEM

Let's take a look at the men and physical properties behind this pipeline system. Let's see what it takes to move gas many hundreds of miles to homes, businesses and factories in the West.

Pipelines

Obviously, if a gas company is going to be able to deliver some 3.4-plus billion cu ft of gas per day, it will have to have some pipe in the ground. EPNG has pipe in the ground—and lots of it. This company currently sends natural gas flowing through over 10,000 miles of mainline and branch pipeline. Most of this pipe ranges from 16- through 34-in. OD, while about 3200 miles is 12-in. OD and smaller.

In addition to piping classified as pipeline, El Paso has other lines to gather gas and bring it into the mainline system. The big Texas-based company therefore currently operates another 7900-plus miles of gas gathering and field lines. In total, it owns and operates over 18,000 miles of piping to take gas from wellheads and move it across many types of terrain for delivery to distribution utilities and other customers.

Compressor facilities

Natural gas will not flow up hill and across plains from the Permian basin to California or from the San Juan basin to Seattle without compression. On El Paso's system it takes a total of 1,119,859 installed compressor station horsepower to do the work of moving this mass-flow of energy. In the mechanics of gas compression, El Paso Natural has done some real pioneering for the gas industry.

EPNG design engineers and compressor station operators have continually cooperated with manufacturers to improve compressor station equipment performance and help with development of new units. For example, the company has field tested most of the new engines developed by Clark Bros. Co. and

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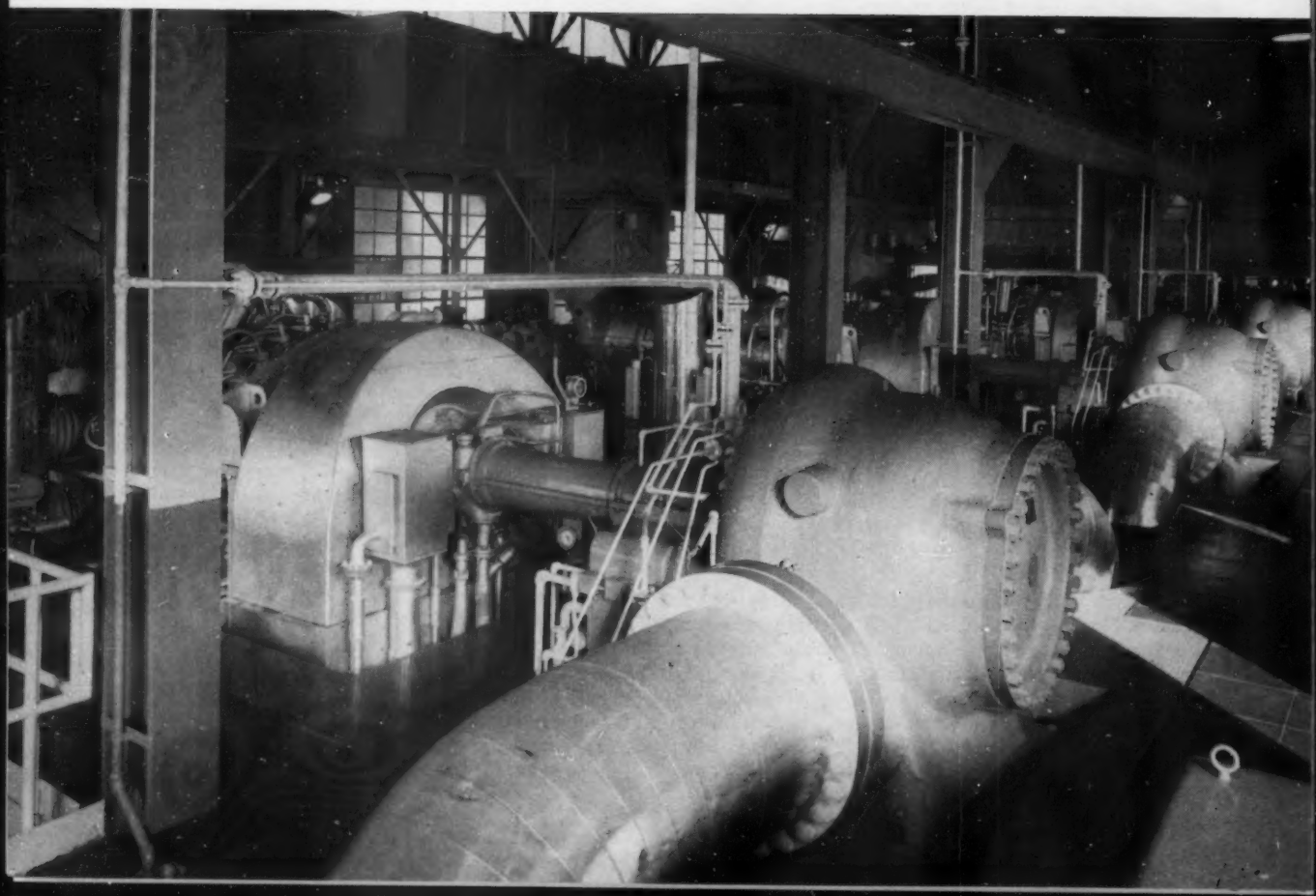


Cooper-Bessemer Corp., down through the years.

And, El Paso Natural was the first gas pipeline company to make more than limited use of combustion gas turbines to drive centrifugal compressors. Thirty-two gas turbine-centrifugal combinations are now compressing gas on the system, installed in 12 separate compressor stations.

Early application of this then-unique machinery was the result of selecting intermediate booster stations as the economical choice, within EPNG's particular transmission system, in boosting capacity—over (1) additional horsepower at existing reciprocating stations, and (2) adding pipeline capacity through looping. With meaningful operating experience, El Paso rates its success with turbine driven centrifugals as outstanding. It judges such combinations hard to beat.

Gas turbine-powered compressors aggregate 179,600 hp on the El Paso pipelines today.

Semi-automatic, electric-motor driven, centrifugal gas compressors have been installed on this company's mainlines in the past couple of years. This machinery currently adds 21,200 hp into the total and is performing very well.

In tabular form, the flexibility in EPNG's compressor prime movers looks like this:

Gas engine, reciprocating	919,059 hp
Combustion gas turbine	179,600 hp
Electric motor	21,200 hp
TOTAL	1,119,859 hp

BACKING UP COMPRESSOR STATIONS

Like any other pipeline company's compressor stations, El Paso's are implaced where design engineers find they will perform at optimum efficiency in relation to over-all system operations. A look at the map will tell anyone familiar with the West that EPNG pipelines traverse some of the ruggedest and least populated portions of the nation. A good many of the company's compressor stations, it follows, are out chugging or whining away with little for company other than sagebrush, sandstorms, perhaps some craggy mountain peaks, the bright stars overhead at night, and maybe a near-wandering coyote telling any who can hear that he is equally lonely.

Remoteness means that El Paso Natural has to build small, but almost complete cities for personnel who operate some compressor stations. This can include company cottages; water systems for drinking and sanitary purposes, as well as for fire protection and mechanical cooling; electricity has to be generated for both domestic and plant use at some locations; and the company supplies recreation facilities as well as the many other things a group of people needs for reasonable living conditions. Uniquely, school bus service to take children of El Paso families maybe 50 or 60 miles to public schools are provided for some compressor stations.

Taking electricity as an example, due to the lack of commercial sources, the El Paso company generates twice as much power as it buys. Chief Electrical Engineer Jim Hoffman reports that EPNG produces enough electricity to supply residential requirements for a city of 150,000 population. The job is done with: (1) gas-fueled engine-driven generators, (2) steam turbine-driven generators, and (3) gas turbine-driven generators. In some instances, one station or plant will have generation capacity to both serve its own needs and supply electricity to other plants in its general area through electric transmission lines.

And take water specifically. Nowhere else in the United States is the relationship between water and life—and lack of it and death—so pronounced as it is in El Paso Natural's prime operating area between west Texas and the Pacific ocean. And El Paso's compressor stations, treating plants, and cottage areas must have water.

In some cases, the filling of the need is as simple as calling a local water department for service. But, such instances tend to be few in the generally arid Southwest.

At most installations the pipeline company has had to find its own water source, then bring it to the plant or station, and process it as required. This involves drilling a water well. If it's a dry hole, drill another. And keep on drilling until water is hit. There is no alternative—the installations and their people must have water. If water can't be struck on or near the station, then the company has to widen its search until a source is drilled in or otherwise found. Then, water has to be piped to the station or plant—from as far as 50 miles away, in one case.

Even after water is found, problems remain. For, the Southwest is a perverse part of the country. Water there is apt to be very hard (up to 1000 or more parts per million hardness is not uncommon); and it may or may not have a disagreeable smell; and it may or may not have an objectionable color. Needles to say, treatment is normally required. Hardness means high maintenance, rust, scale, and general corrosion. And domestic water must not have any objectionable properties. So, EPNG treats it.

It is interesting to note that specialized uses for water include nozzle cooling for white-hot jet nozzles in EPNG's gas turbines. Distilled water has to be used and at each turbine station on the system distillation apparatus has been installed. Special closed water systems (435 gal. capacity) deliver the distilled water to jet nozzles, though actual usage is only about one pint per engine every three or four months.

Well, the point is, that a compressor station is more than X-number of installed horsepower. Many facilities of many varied natures have to back up the "horses." On El Paso's system fulfillment of the needs involves rather complex solution to a number of resultant problems, due to the nature of the country much of its pipelines travels through. There is no implication here that other companies don't have some remote stations in pretty rugged surroundings. They

Interior of EPNG's Leupp, Ariz., 33,000-hp reciprocating compressor station (top photo at left). As can be seen, El Paso hires and trains many Indians of the area. Below is an interior view of a gas turbine compressor station on the mainline. These three turbine-centrifugal units develop 17,100 hp.

do and they also overcome the problems. But for most companies, such stations and problems are exceptions and relatively few. For big El Paso Natural Gas Co., they are more par for the course.

EPNG'S GAS SUPPLY

Compressor stations and thousands of miles of steel pipe go a long way toward making a pipeline company. But a company has to have something to put into the system or it simply has thousands of miles of "hole." I dropped in on Art Hill, EPNG's general manager of production and exploration, to see what El Paso has in the way of natural gas to transmit through its giant system.

Naturally, with sales that may hit 1.58 trillion cu ft per year relatively soon, the company has some gas reserves. It had dedicated to it some 37.7 trillion cu ft of gas when I talked with Mr. Hill. There is little need to store that figure in your mind, however, because if it is not out of date by the time you read this, it shortly will be. Mr. Hill and company are not content to maintain a status quo even with gas reserves representing a 24-year life index. On the contrary, Production and Exploration is out working every day to find and drill, or contract for, additional gas reserves.

El Paso's prime supply is from major oil and gas producing companies. Perhaps 85 per cent of its gas is purchased from this usual gas industry source. A gas purchase contract department officed in Houston—the oil and natural gas center of the nation, if not the world—handles gas purchase operations.

But the big El Paso, Texas-based company does not wait for gaseous hydrocarbon producers to walk in its front doors. The production and exploration department has 10 gas-oil field scouts in five areas constantly keeping abreast of drilling activity in exploratory and wildcat wells, in particular, and all wells in general. Data from these activities are fed back through the department. Hence, the contract department receives fresh information and is often able to contact a producer to indicate El Paso's interest in obtaining any gas before wells are even completed.

Further, El Paso drills about 250 wells itself in an average year. Some of these are wildcats; many more are development wells. The company's success ratio on wildcats over the past five years is better than 50 per cent.

Right now EPNG has active exploration under way in: (1) the Gulf coast, (2) the old, but certainly not through, Permian basin, (3) the Panhandle country of Texas and Oklahoma, (4) all over the Four Corners —San Juan and Paradox basins, (5) throughout the general Rocky Mountain regions, and (6) in some of Canada's most prolific, and relatively unexploited, areas. These operations can best be described as an active and aggressive exploration and drilling program.

El Paso Natural Gas feels that all of these areas have good future potential. Some through discovery and extensions; other through improved drilling and production technology.

But that is not all there is to the production and exploration department. Under Art Hill there is also a reservoir and reserves section. This unit evaluates both producers' and El Paso's strikes. Before it signs a long-term gas purchase contract or starts production from one of its own wells, EPNG wants to know: (1) the ultimate volume of the reserve, (2) its proximity to an EPNG pipeline, (3) the character of the reservoir, (4) the quality of the gas, (5) the pressure of the gas, and (6) the price is known to be of some importance. Reservoir and reserves people produce the answers.

A geological and exploration section is always adding to the effort that keeps El Paso Natural's gas supply growing faster than sales—about four times faster, according to my last report. These are the fellows that use their sophisticated technology to tell the company where it has the best chance of hitting a commercial reservoir of gas (and oil) when it drills its own wells. Having its own reserves gives better control for the system, and makes more economical gas available because the company can usually produce gas cheaper than it can be purchased from non-affiliated producers.

HANDLING RESIDUE GAS

As any good gasman knows—but as few gas consumers seem to realize—you usually can't take wellhead natural gas directly to customers' appliances. It has to be processed and treated first.

In this field, El Paso Natural has again pioneered. Back in 1928-29 when the company was doing business out of a one-room office, it planned to pipe gas from those three wells over in Lea county, N. M., for distribution and sale in El Paso. It planned and built on the premise that the gas was sweet. As fate would have it, very little of this production had been taken through the pipeline before it became patently obvious that while it had been sweet during the planning stages, most of it reverted to sour gas upon starting operation.

In those days, sour gas was a big-problem type of thing. It simply wasn't commercial and most of it was flared to the air. A way to treat this gas had to be found, but valid technology was meager. El Paso Natural developed a treatment process.

I will not become involved in an argument which might erupt if I said this company was the first to learn how to process sour gas. But certainly it was among the very first companies to create a treatment process and design plants that enabled sour gas to be handled satisfactorily in a gas pipeline and distribution system. The company has continued to pioneer or develop improved methods and equipment for gas treatment through its history. And in the doing, it has contributed importantly to the technology that made sour gas a commercially marketable product.

El Paso Natural Gas Co. contributed another major advance in utilization of this nation's energy resources in 1940 when it showed the gas industry that a pipeline system could use large volumes of residue gas in normal operations. Operating with residue gas was, and is, not easy.

In the Permian basin, prior to the time when El Paso started taking appreciable volumes of residue gas, this resource was burned to the air. It was flared because there were relatively few recycling

Beautiful Window Rock (Ariz.) station, a 22,500-hp reciprocating compressor installation.

programs in the basin due to stratigraphy of the formations and physical characteristics of the producing sands. And there was nothing else to do with it as there were no pipelines willing to purchase it as gas supply.

There are several reasons why gas pipeline companies tended to stay well clear of Permian residue gas. First, it required pretty heavy investment in treating facilities as the Permian residue was sour, wet and low pressure—not of pipeline quality. It was loaded with sulfur and sulfur compounds, and liquefiables that should be recovered. Too, it was wet; hence, a company desiring to use it in pipeline operations had to build treatment, extraction, dehydration, and field compressor plants to render the flow pipelineable.

But more important than that, there was and is a direct relationship between residue gas production and crude production; but, there is no relationship between crude production and gas pipeline customers' requirements.

Permian basin residue gas is produced in direct relation with the demand for petroleum products as set forth by the number of allowable producing days handed producers by regulatory-conservation agencies of Texas and New Mexico. Such allowables can and do change from month to month.

These dipsy-doos of crude proration are delightful for market balancing and conservation in the oil industry. However, they really are not at all salubrious to pipeline companies that operate with some residue gas.

For example, a change of one producing day in allowables for a given month means that the El Paso system will gain or lose availability of about 50 MMcfd for that month. Further, oil operators tend to "use up" their allowable days of production from well before, to at least several days before, the end of each month—for they can't carry an allowable over into the next month. Thus, EPNG is very apt to have a serious reduction in residue gas availability during the last few days of any month.

Now, should an unusually cold period hit in market areas during these last few days of the month when most producers have already taken their allowables and are shutdown, then, El Paso Natural has to pull out perhaps 500 MMcfd of formation (dry gas-well gas) gas as replacement.

As difficult as the use of residue gas is, EPNG's ability to operate with large volumes of it is a valid contribution to natural resources conservation. In 1959, for example, the El Paso company marketed over 300 MMcfd of residue gas. This has an energy equivalent of 200,000 bbl of oil per day or 73 million bbl of oil a year. A great deal of this gas would have simply been wasted if EPNG had not had a capability

PAUL KAYSER
Chairman of the Board and
Chief Executive Officer

HOWARD BOYD
President

to take all residue gas offered each producing day by Permian basin oil operators.

EPNG'S RESOURCES OF PEOPLE

People are the most important resource of a gas transmission company. And El Paso Natural Gas Co. has many people working on its team. Over 7100 employees man its operations and those of certain of its subsidiaries. But numbers alone do not tell the story.

I have found El Paso Natural's people to be real know-how types. Further, from personal visits within the company, I'm firmly convinced the EPNG folks are friendly, cheerful, agreeable and helpful people. Among the gas pipeline companies, and without the slightest detraction intended or implied to other transmission companies, I have to rate El Paso Natural Gas Co. people as tops—and I have visited nearly every gas pipeline company in the United States and Canada, and some in more distant lands. Fine people make a good company. And both are reflections of the attitudes and abilities of good management.

The gas industry, much of the nation's business community, and perhaps many in the free world know of the accomplishments and character of El Paso Natural's Chairman and Chief Executive Officer, Paul Kayser, so it would be repetitious to repeat them here.

The president of the company is big, red-haired, able and dynamic Howard Boyd. He joined El Paso in the early fifties following a distinguished legal career. Mr. Boyd was elected president in April 1960.

Arnold R. LaForce serves as EPNG's executive vice president. His specialty is finance. Formerly he was a professor of finance and investment at New York University; later, he held a vice presidency with Metropolitan Life Insurance Co. Mr. LaForce joined the pipeline company in 1956.

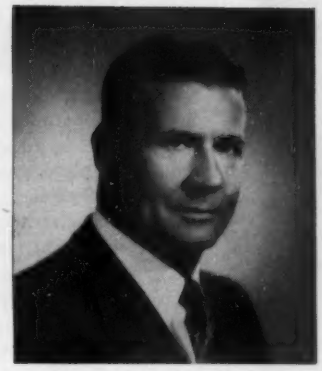
One of the outstanding things about the subject organization's management, and perhaps one might say it is somewhat unique, is the deep respect the field employees have for El Paso's executives. They obviously feel operations executives know the field work and talk the same language. And we will say that it's true.

For example, EPNG has such people as C. L. Perkins, vice president; H. F. Steen, vice president and manager of pipeline operations; J. F. Eichelmann, vice president and executive engineer; R. W. Harris, vice president and manager of the Rocky Mountain region; etc. These men—and so many, many more in places of supervision and leadership—were true field "hands" when the company was just getting started and while it was molding itself into a major gas pipeline company. Such men gained invaluable experience in the days when this company built its first pipelines, compressor stations and plants. They used hands, shovel and muscles—actually building facilities and then operating them.

Executives with years of do-it-yourself construction and operating experience are hard to come by—at any price—in the gas industry today.

Until the fairly recent periods of the company's history, El Paso Natural constructed pipelines with its own spreads; it built its own compressor stations, and processing and extraction plants; and it drilled its own

ARNOLD LA FORCE
Executive Vice President



C. L. PERKINS
Vice President, EPNG, and
President of Subsidiaries

HUGH F. STEEN
Vice President and
Manager, Pipeline Operations

wells. What better training and experience can gas company personnel have?

El Paso did most of its own construction in its early phases for two reasons: (1) in its operating country, there were no contractors (or others) with the forces and equipment to build them, and (2) with the foresight in mind of using the construction and expansion of its system as a training ground for management of the future.

THE OPERATING DIVISIONS

A centralized management system is used for the vast pipeline enterprise. From it spring four major operating divisions, with two administered from a region office.

Working from east to west, and then northward, the division set-up looks like this.

Permian Division

The Permian division operates east of the Pecos river. Division operating manager is Estin Scearce, who travels out of El Paso. This unit can be pictured as a huge production and processing division; however, it does operate the mainlines and their compressors over to the Pecos river. Operating headquarters are in Jal, N. M.

Permian division takes gas from more than 36,000 wells—of which EPNG operates some 5500. Gas taken can hit 2.7 billion cu ft a day. And, about 60 per cent of this is separator gas, which means that this division does a lot of treating and extracting before the residue gas can be introduced to the mainlines. This is done in some 24 dehydration-purification plants, and 7 EPNG-owned natural gasoline extraction plants. The company is a co-owner of three other gasoline plants in its Permian division. Further, there is a carbon-dioxide removal plant operated by the division in Terrell county, Texas.

Covering most of west Texas and the Texas Panhandle, as well as a portion of New Mexico, Permian division is big. It takes about 1500 people to run it. Some of these people and their families live in the 773 EPNG-owned houses in the division. And, they move around in their work via the division's 377 vehicles (driving about 9.8 million miles a year) and a twin-engined Cessna aircraft that flies 60 to 70 hours per month.

While the Permian basin and Panhandle-Hugoton fields are old, as gas fields go, production is still on the upswing. Some of the old fields never had an economical pipeline outlet. Too, new fields are still being hit, and with the improved technology now available, there is no reason why production from fields in the Permian division won't still look good as a gas producing region 50 years from now.

Roughly 60 per cent of El Paso Natural's total gas supply originates in its Permian division.

Southern Division

Southern division, headed by W. H. Miller, is headquartered in El Paso. The geographical area that is the operating territory of this division is also huge.

Its responsibility extends from the Pecos river west, across most of New Mexico and all of Arizona to the

California border marked by the Colorado river. The division's southern boundary is the United States-Mexico border. To the north, it extends to near Gallup, N. M. Thus, most of the mainlines across the southwest to California, and their many thousands of compressor-station horsepower, are operated by Southern division.

This country is wide, dry, lonesome and beautiful. Tawa, a god of the Hopi Indians, walks across its sky every day, "packing" (as we say out west) a flaming stone—the sun. Whether you believe Tawa is actually doing the job or subscribe to the later theories developed by much more scientific, but not nearly as imaginative, astronomers; the sun does shine on Southern division's country. It keeps it from comfortably to dreadfully hot much of the year, but with the perversity that characterizes the great Southwest, winter months can be bitterly cold.

Through heat and the cold; the dryness and the flash floods; El Paso's Southern division personnel keep the southwest mainlines' piping warm and throbbing carrying enormous volumes of energy to bustling, bursting California and populuses en route.

The prime arteries in the division are the southern mainlines from Texas to California; the San Juan basin to California mainlines; and the crossover mainlines that tie the Permian basin into the mainlines from San Juan basin. On the latter, Southern division picks up operations at the Pecos river.

None of these are a single large-diameter pipeline. Rather, they are looped and paralleled systems that make two, three and four large-diameter multiple pipelines. And, branch lines take off from the tap-root mainline systems to take gas to cities or industries along the way.

Few people traveling the country represented by the Southern division in El Paso's operations realizes that they more or less parallel these vast energy-mov-

Above: El Paso drills about 250 wells per year—in addition to purchasing gas from hundreds of producers. Crossing the mighty deep and wide Columbia river (right) during construction of the EPNG line that takes off from its Northwest division's mainline to bring natural gas to Salem and Eugene, Ore. At far right, a crew coats and wraps a 34-in. line near Blanco, N. M. The country here is pretty typical of Southwest pipelining.

ing systems. The southern mainlines keep in pretty close touch with the highway linking El Paso and California via the southern route. Also, the Southern Pacific Railroad's tracks are never very far away.

They don't realize that a little clump of trees and a green patch, which show up pretty small in the distance, may surround, and partially hide, a spanking-clean militarily-neat compressor station. Said station might be a 24,320-hp reciprocating installation such as that near Wilcox, Ariz. Or, it might be a 17,100-hp gas turbine station such as those at Florida, N. M., and Cornudos, Texas. It could be a 10,000-hp electric-motor powered station as is located at Seligman, Ariz.

The more northern mainlines system pick up famed U. S. Highway 66 in mid-New Mexico and go along with it to the Colorado river. However, tourists probably see little of the El Paso system and what they do see of it probably doesn't mean much.

Regardless, Southern division's men are out on the pipelines or in the stations night and day, rain or shine, in snow or sandstorm—tending, overhauling, maintaining, and operating this vast El Paso Natural system of mainlines across the fabulous southwest.

San Juan Division

San Juan division has its operating headquarters in the Four Corners area at Farmington, N. W. It is part of the two-division Rocky Mountain region. San Juan's division manager is Ed Alsup.

They do a little bit of everything in the San Juan division. It has large production, purification and dehydration, gasoline absorption, compressor station and mainlines activities. And it can be thought of as a connection or switching center, and a very large one at that. For, San Juan division operating territory sits between the El Paso mainlines through the Southwest and the pipeline system going up to the Pacific Northwest.

Gas produced in the San Juan division can be sent up to the Pacific Northwest—even to Canada. And it can be moved to California. Usually, it is doing both. While it is not done, through the interconnections in this division, El Paso Natural can physically send Texas-produced gas to Canada or bring Canadian-produced gas to California. Such flexibility greatly enhances the El Paso system.

Some good gas production lies in the San Juan division's operating area that extends from Gallup, N. M., to Moab, Utah. Principal fields are the Aneth in the Paradox basin and the entire San Juan basin. About 13,500 billion cu ft of gas reserves therein are dedicated to or owned by El Paso. Most of it is dry.

El Paso and production subsidiaries have carried out an extensive drilling program in the San Juan during the past five years. Some of these produce from two or three different formations. EPNG pioneered gas drilling in the San Juan basin and has stimulated every one of its wells there to better (more and cleaner) production.

There are about 3900 wells in the San Juan and it has been estimated that the formation gas (dry) of that basin area has been about 62 per cent developed. EPNG drills and produces about two-thirds of the formation gas it takes from the San Juan, and has long-term purchase contracts for its other third.

Much of the San Juan division's country is very rugged and untamed. After visiting through it, however, one can only say that it too is beautiful. Roads are not numerous, but even so activity in gas and oil, and other minerals, has radically changed the picture from what it was just a few years ago. Many EPNG installations therein are quite isolated. For some, a school (even a one-roomer) 20 miles aways is "close" company. But, it is real great country for employees who like to hunt and fish—and it appears that most of them do.

Northwest Division

Northwest division is the other half of El Paso's Rocky Mountain region. The division is under H. P. Logan and is headquartered, with region headquarters, in a modern building in Salt Lake City, Utah.

Northwest division's mainline extends from Moab, Utah, through parts of that state and in Colorado, Wyoming, Idaho, Oregon, and Washington as it reaches for and passes through the Pacific Northwest to touch the Canadian border. It is both a very interesting system and very unique among our nation's pipelines.

This mainline has the San Juan basin gas on its southern end; Canadian gas on its northern extremity, due to a connection with the Westcoast Transmission Co. Ltd. pipeline; and it has gas supply near mid-way along its route from Bar-X, Garmesa, Piceance Creek, Rangely, and Big Piney fields. And much of the 1487-mile pipeline is designed to permit gas to flow in either direction.

So, the pipeline has gas supply along its route and on both ends. And it can move gas in both directions. This system was the first built in this way. Gas from the three sources along its route are about evenly balanced; hence, about a third of the supply comes from each. Thus, "fronts" are produced where gas from two sources mingles.

Fronts move from time to time, of course, and at some periods remain fairly constant. Generally the Canadian gas "front," for example, spends the winter near Portland, then drops down to hover between Pocatello and Boise, Idaho, during summer.

Rocky Mountain Region

The Rocky Mountain region of El Paso Natural administers and oversees operations from Salt Lake City. R. W. Harris heads up this entity as a company vice president and manager of the region. His responsibility extends from the California-bound mainlines near Gallup, N. M., to the Canadian border in Washington. His principal operating units are, of course, the San Juan and Northwest divisions.

COORDINATION OF THE VAST SYSTEM'S OPERATIONS

So far, then, we have taken brief looks at El Paso's pipelines, gas supply, people, and administrative organization. And we have very briefly visited the four operating divisions—each of which could make a story in itself.

Employees of the customer gas companies in Washington, or Idaho, or California might wonder how El Paso ties all of these pieces together so that each part operates in phase with the other and with the flexibility the complementary systems produce. Two important factors in the integration of the many sys-

In rugged San Juan basin country, a helicopter approaches a well that is isolated by melting snow making "roads" impassable.

EPNG has service stations too! A subsidiary, El Paso Natural Gas Products Co., refines, upgrades and converts crude oil and natural gas liquids. Modern "Service Stations With a Flair"—nearly 600 of them—make seven grades of "El Paso" and "Dixie" motor fuel available to the motoring public through much of the Southwest. The Products Co. also has extensive petrochemical activities. Station pictured is in Durango, Colo.

tems and operations into a unity of gas service are: (1) a wide spread, efficient communications system, and (2) plenty of transportation equipment.

Again, we have to consider the country EPNG pipelines and installations are located in. Distances are formidable. Cities are few and far between unless you want to class typical small western farm-ranch communities as such—and most of these do not have even a few of the basic services available in what people in other sections of the country expect in their cities. Even today, in some areas in which El Paso Natural pipelines are functioning, such basics as roads, airline service, railroads, and public communications media are from rather inadequate (for a big gas company with precision operations and a heavy public service obligation) to nonexistent.

Well, if something happens or something needs to happen in its pipeline systems, El Paso's people do not have to wait for Aunt Heppie to get through chatting with the minister's wife on a rural party-line telephone system. The company has a communications network that includes 7000 channel-miles of leased wirelines; over 500 miles of company-owned wireline, a VHF radio system with 64 base stations and 798 mobile units; and 24,500 channel-miles (2000 RF path-miles) of microwave radio links. It is one of the largest privately owned microwave system in the U. S.

This communications system renders voice, teletype, telemetering, data transmission facsimile, and supervisory control services. It is another reason why EPNG customers have learned to worry little about continuity of their gas deliveries.

And El Paso's people have to move around; and, they need mobile and portable equipment to work with. To get them from here to there, the company owns some 625 passenger cars; another 600 pickup trucks— favorite transportation of well switchers and other production and pipeline field men; 240 or so heavier trucks; and a host of tractors, motor scooters, ditching machines, maintainers, etc. Plus, another 550 pieces of work equipment ranging from water pumps to pipelaying "cats."

El Paso employees log 1200 or so trips around the world in equivalent mileage each year. A typical year's gasoline tax bill might run $310,000 and license plates might cost another $90,000.

Line riders and walkers have about faded into the past for EPNG. Now, several light planes have taken over the pipeline control. Much of the long, lonely, tedious—and therefore hazardous—driving has also been eliminated.

Now, fifteen light twin-engined aircraft move key personnel around the system in small fractions of ground-transportation times. Anyone who has driven through the Southwest and from there up into the Northwest can attest that such airplanes not only save the gas company more than ample valuable personnel time, but put employees down near company installations or offices ready to go to work, instead of ready to collapse.

These busy workhorses of the air—with which EPNG flies more passenger miles than some commercial airlines—are considered routine and indispensable pipeline tools by the company.

GROWTH WITH SERVICE

El Paso Natural Gas Co. has grown a lot since 1928 when it started planning around three gas wells and 200 miles of 16-in. line. The key to that growth has been service. When any customer company required more gas, El Paso has always been ready, willing and able to purchase, produce, treat, and deliver it. Further, the continuity of delivery of the full contract volume to any and all customers has never been seriously disrupted. That's service.

But El Paso Natural still has some growing to do. With its philosophy that material growth only follows moral growth; as this company moves through the years ahead, its chronicle will remain the *Story of Growth with Service.* ■

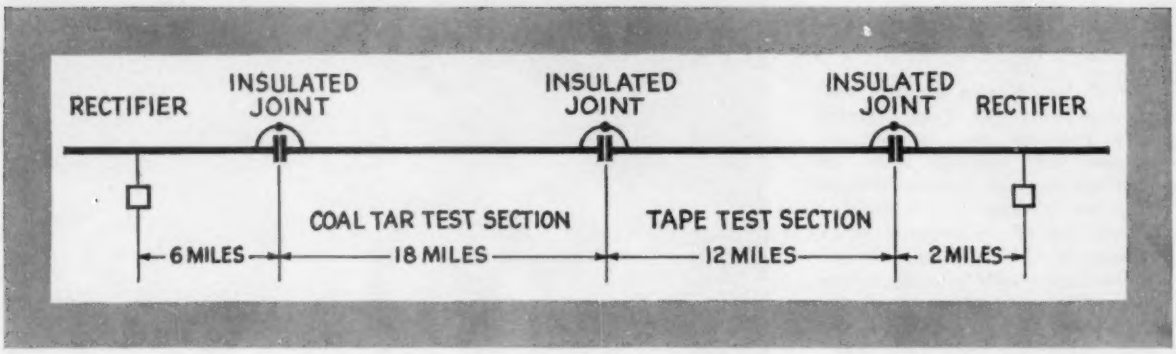


Fig. 1. Location of 12- and 18-mile test sections.

Polyethylene tape coating

A seven-year test report

By ***MARSHALL E. PARKER***
Consulting Corrosion Engineer

A CONTINUING test of polyethylene tape* as a pipe coating material has now reached seven years' duration, and the performance is eminently satisfactory. Site of the test is a pair of isolated sections in Seadrift Pipeline Corp.'s Burnell line, located in Refugio and Goliad counties, on the Texas Gulf coastal plain. The line is a high pressure gas transmission line of 8⅝-in. OD welded steel construction. The two test sections are 12 and 18 miles in length, and are located as shown on *Fig. 1*. The 12-mile section was coated with polyethylene tape, the material under test; the 18-mile section, like the remainder of this line, was coated with a standard coal tar enamel as a comparison control. The two sections are separated from each other and from the remainder of the line by means of insulated joints. These joints were subsequently bonded to permit the installation of a cathodic protection system, but the bonds are arranged so that they may readily be opened for testing.

The tape section has a single wrap of calendered, oriented polyethylene tape, consisting of an 8 mil film of the plastic and a 4 mil mass of adhesive. The tape was applied to conventionally cleaned (not primed) pipe by means of a hand-operated wrapping machine. No power tape-wrapping machine was available at the time. Except for a small amount of tape in 300-ft lengths, the coating was applied in 100-ft long rolls (current practice uses rolls of 400, 600 and 800 ft or longer). The tape was applied with a lap of ½ in., and was covered with an unbonded wrap of coal-tar saturated asbestos felt.

The coal tar was applied to a specified minimum thickness of 3/32 in., over machine-cleaned and -primed pipe, and was covered with a bonded wrap of glass-fiber-reinforced tar saturated felt.

The terrain in which the two sections lie is quite similar, being in both cases very flat country devoted to ranching, with some oil and gas production. The soil resistivity in the tape section, as determined by a survey conducted in 1957, has a mean value of 2230 ohm-cm; that in the coal tar section has a value of 2940 ohm-cm. This difference is not large; if it can be said to have any effect at all on the tests, it should be to make the coal tar look slightly better than would be the case if the two soils were identical.

In September 1955, a cathodic protection system was installed on the entire pipeline of which the two test sections are part. This system has been in continuous operation since that time, with the piping being protected most of the time; there have been some lapses, due largely to new construction and the addition of piping to the system, with some time elapsing before a readjustment of rectifier output.

TESTING PROGRAM

The two sections of the line have been the objects of comparative tests at frequent intervals, beginning the month after construction. All of the tests have been basically the same, being aimed at a determination of the coating leakage conductance to remote earth. This

* Polyken pipeline coating manufactured by the Kendall Co.

is considered to be the most reliable quantity for the comparison of coatings, provided that care is taken to allow for the effects of variations in soil resistivity; otherwise a comparison between lines lying in extremely different soils would be unfair to the line in the soil of lower resistivity. As reported above, the variation in resistivity in this case is not sufficient to vitiate the comparison. This method is particularly useful in following the changes in coatings with the passage of time, as has been done in the present instance.

Some of the tests also included data on the amount of current being used in the cathodic protection of the two sections. These can be reported as current *requirements*, although a more accurate term would be current *supply*. If, for example, the mean pipe-to-soil potentials are not the same, then the comparison is not valid; even more so is this the case for line sections with different arrangements of drainage points, and thus different amounts of over-protection due to attenuation effects. A still larger source of error is in the existence of parasitic structures, such as shorted casings, whose actual current demand often cannot be separated from that of the primary structure of interest.

TABLE 1. Comparative Coating Leakage Conductance
(Micromhos per Square Foot)

A. Seadrift Burnell Line (installed February 1954)

Date of Survey	Tape Section	Coaltar Section
Mar. 29, 1954	1.13	3.15
Jul. 6, 1954	1.13	3.52
Feb. 24, 1955	2.64	7.45
Apr. 9, 1955	2.74	7.57
Jan. 29, 1956	10.00	16.56
Mar. 23, 1957	138	43.4
Feb. 17, 1958	132	24
Jan. 19, 1959	117	84
Oct. 27, 1959	128	106
Jun. 1, 1960	133	116
Jan. 16, 1961	102	152

B. Seadrift Goliad Line (installed February 1957) (tape only)

Mar. 16, 1959	4.27
Oct. 27, 1959	6.50
Jan. 17, 1961	7.11

TEST RESULTS

The conductance values obtained in the various tests, expressed in micromhos per square foot, are tabulated in *Table 1*. The same data are presented graphically in *Fig. 2*.

The conductance of the polyethylene section, it will be seen, remained low and almost constant for the first three years, then rose abruptly. Since 1958 it has remained essentially level. For the entire period covered by the test to date the conductance of the

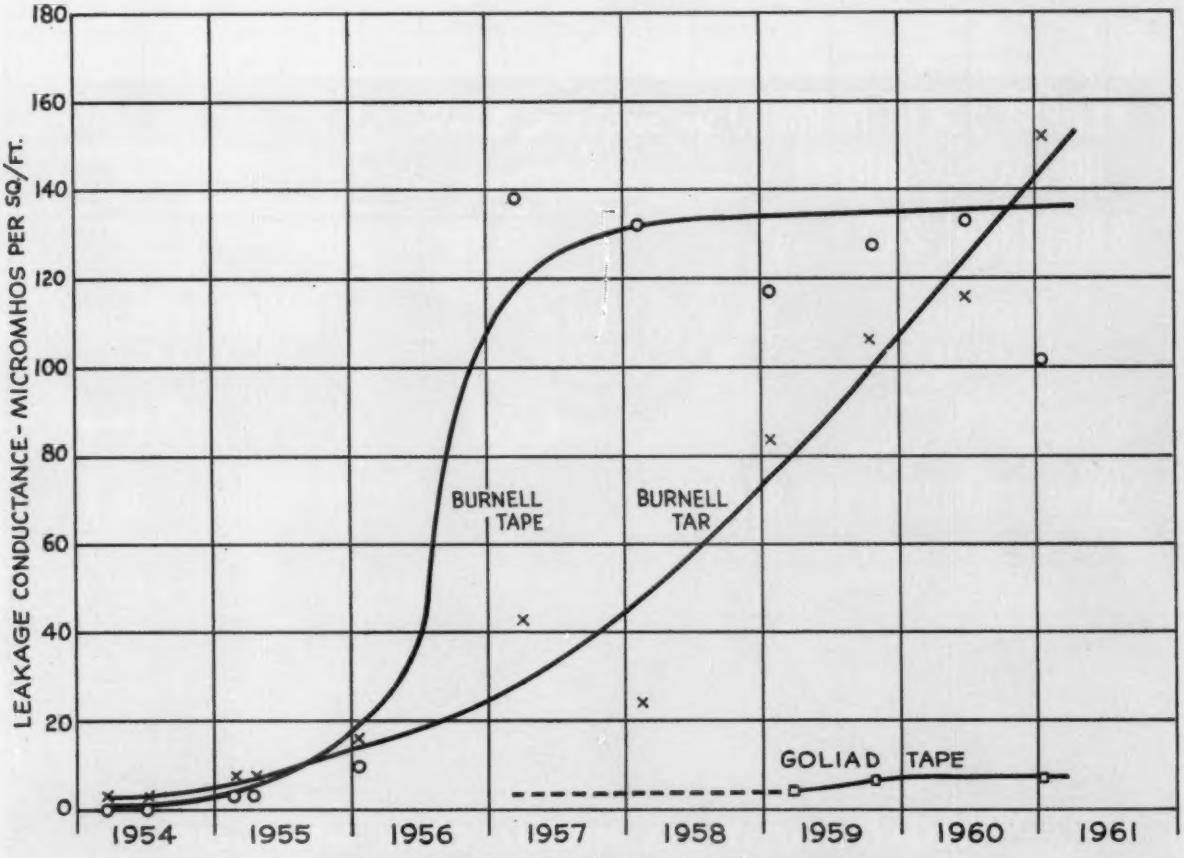


Fig. 2. Conductance values obtained in various tests.

coal tar section has gradually increased, passing, in 1961, the value for the tape for the first time since early in the test.

The rapid increase of conductance for the polyethylene tape section in 1956-58 required an investigation to determine its cause. In an attempt to localize the current demand, a Pearson survey was conducted in 1958. Fifteen fairly strong holidays were indicated in the first 1.5 miles of line laid. Two of the stronger ones were excavated for inspection. The same thing was found in both cases; a large wrinkle was observed where the tape roll had not been properly matched at the beginning of a new roll. This resulted in improper coating of a few square inches of steel at each faulty roll change. In both instances the wrinkle was on the side of the ditch which had been away from the crew, and hence had escaped visual detection. Since there was no actual break in the tape, the holiday detector had not been able to detect the lack of bond. A study of the spacing of stakes marking the Pearson holidays indicates that their regular spacing was attributable to the same cause, i.e., faulty matching of new tape rolls.

This exposure of bare steel which occurred at the time of installation is considered to be entirely due to application and inspection inexperience. Its effect was exaggerated by the use of short rolls, these being the best available at the time.

Examination of the rainfall data for this area from 1954 to date reveals the probable cause for the *apparent* low conductance values in the 1954-56 period, and the sudden increase in 1956-58. *Table 3* presents the monthly precipitation figures for the closest weather station of record, Victoria airport, which is located about 40 miles from the junction between the two test sections. Although not shown here, the data for the two or three years preceding the construction of the line also reflect abnormally low rainfall. The soil at pipe depth, in other words, was quite dry *and remained so for about three years.* During this interval these holidays just described contributed very little to the conductance as measured, simply because there was little or no moisture in contact with the

TABLE 2. Comparative Current Demand

(Microamperes per Square Foot)

Date of Survey	Tape Section	Coaltar Section
Mar. 29, 1954	0.53	0.51
Mar. 10, 1956	0.62	1.90
Nov. 22, 1956	12.2*	5.45
Jan. 19, 1959	16.55*	2.72
Mar. 2, 1961	2.32	2.55

*—Includes unknown amount of current flowing to shorted casing. Casing short repaired 1959.

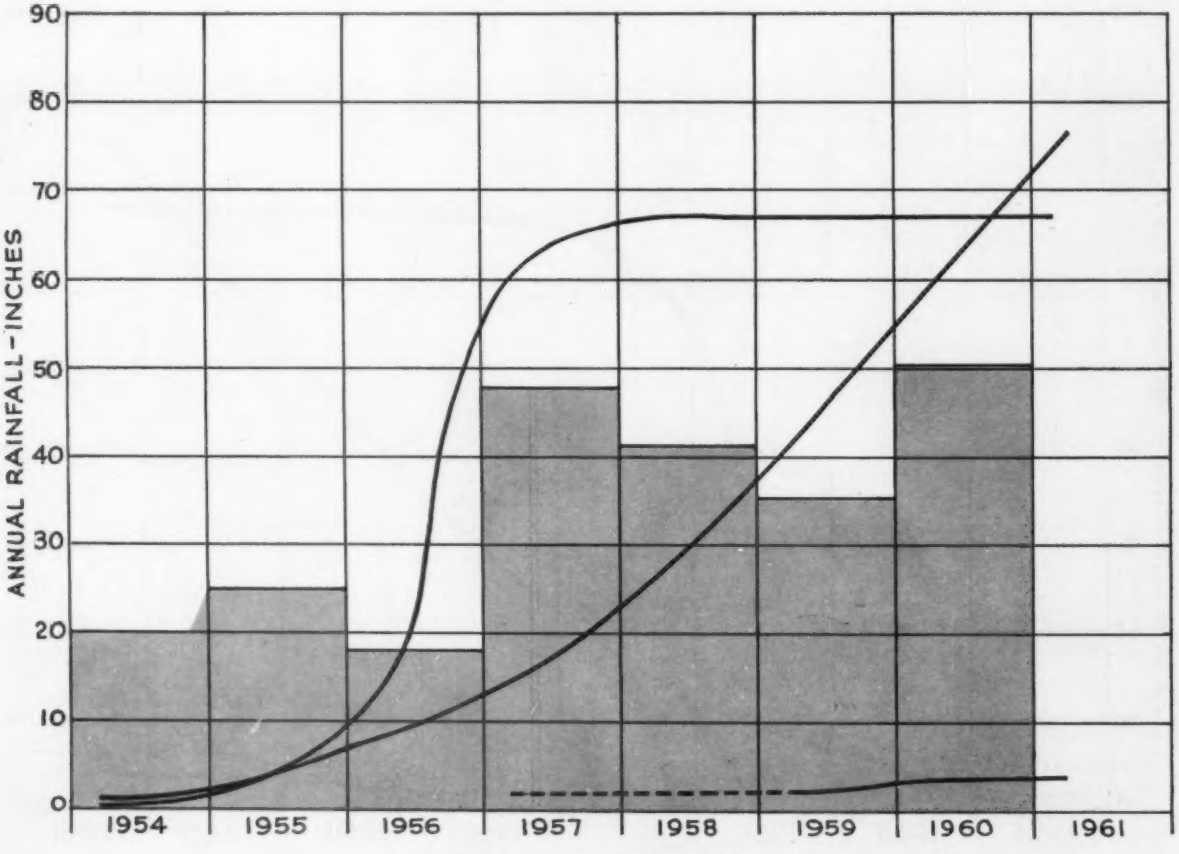


Fig. 3. Soil moisture and conductance.

TABLE 3. Monthly Precipitation
(Victoria Airport Weather Station)

	1954	1955	1956	1957	1958	1959	1960
Jan.	0.84	1.17	1.14	0.66	4.02	0.31	0.52
Feb.	0.20	2.81	0.80	3.19	5.26	5.32	2.47
Mar.	0.46	0.72	0.64	7.91	1.25	0.38	1.20
Apr.	3.55	0.78	1.83	7.05	0.93	1.73	0.78
May	1.69	2.15	2.50	6.06	0.93	3.24	2.11
June	1.40	1.97	1.18	5.03	0.76	3.39	5.26
July	0.71	2.71	0.70	0.11	0.88	1.03	4.14
Aug.	1.11	5.10	0.41	1.13	0.45	5.31	7.81
Sept.	2.64	3.78	1.92	5.11	13.43	3.31	0.76
Oct.	4.52	1.65	4.23	3.10	8.08	6.58	17.25
Nov.	1.34	1.65	0.30	7.38	1.12	1.05	3.80
Dec.	1.39	0.37	2.30	0.83	3.90	3.57	4.18
	19.85	24.86	17.95	47.56	41.01	35.22	50.28

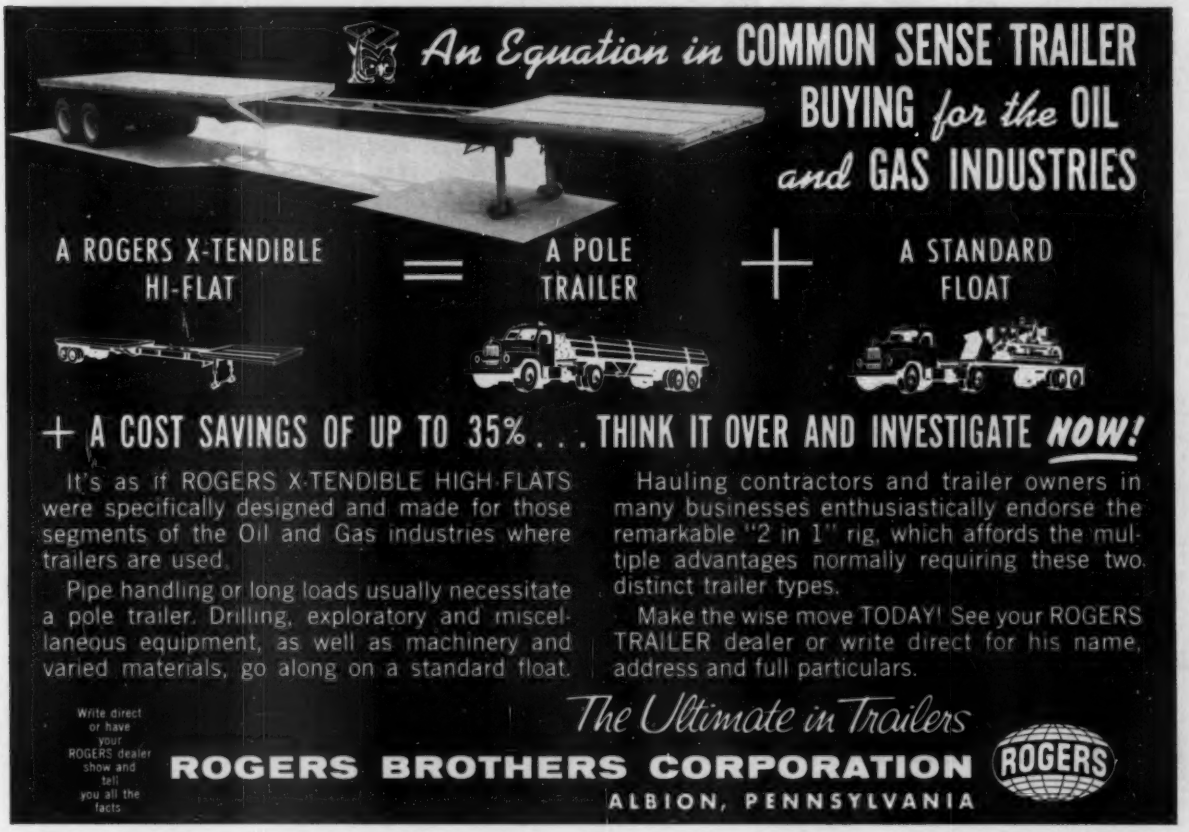
pipe within them. Then, when soil moisture rose to the level which has since been maintained, the conductance rose to its true value, and has remained essentially constant since that time. This is illustrated in *Fig. 3*.

This indicates that, when properly applied, polyethylene tape coating constitutes a stable system on a cathodically protected line, and that it is not subject to observable deterioration in the soil environment.

Additional testimony to this effect is derived from the performance of another line in the same area, and belonging to the same company, coated with the same polyethylene tape which was used on the Burnell line. This is the 6⅝-in. welded steel Goliad line of 31-mile length, built in February 1957. The lower curve on *Fig. 2* shows its performance. (Note that the first determination of conductance was not made until the line was two years old.) This line was coated with power equipment, using 600-ft rolls. Its conductance has been quite steady and at four years of age is 7.11 micromhos per square foot. The results on this line confirm the service stability of properly applied polyethylene tape (*Fig. 2*).

Current demand data for the two sections is presented in *Table 2*. The 1956 and 1959 values for the polyethylene tape section are known to be far too large because of a shorted casing which existed at that time, and which was demanding a large part of the current supplied by the cathodic protection system. The other values are believed to be valid, within the limitations of possibly non-comparable attenuation and protective levels on the two sections. No accurate current demand data are available for the Goliad line; the entire line is drawing less than 3 amp, but there are definitely known to be at least two parasitic drains on the line.

The basic conclusion which can be drawn from these experiences is that the polyethylene tape used in conjunction with cathodic protection has in adequate measure performed the function of protecting the buried pipelines. Furthermore, the environmental and physical stability of polyethylene, well known under laboratory conditions, is exhibited by the manufactured product, calendered, oriented pressure-sensitive polyethylene tape, under cathodically protected line burial conditions. ■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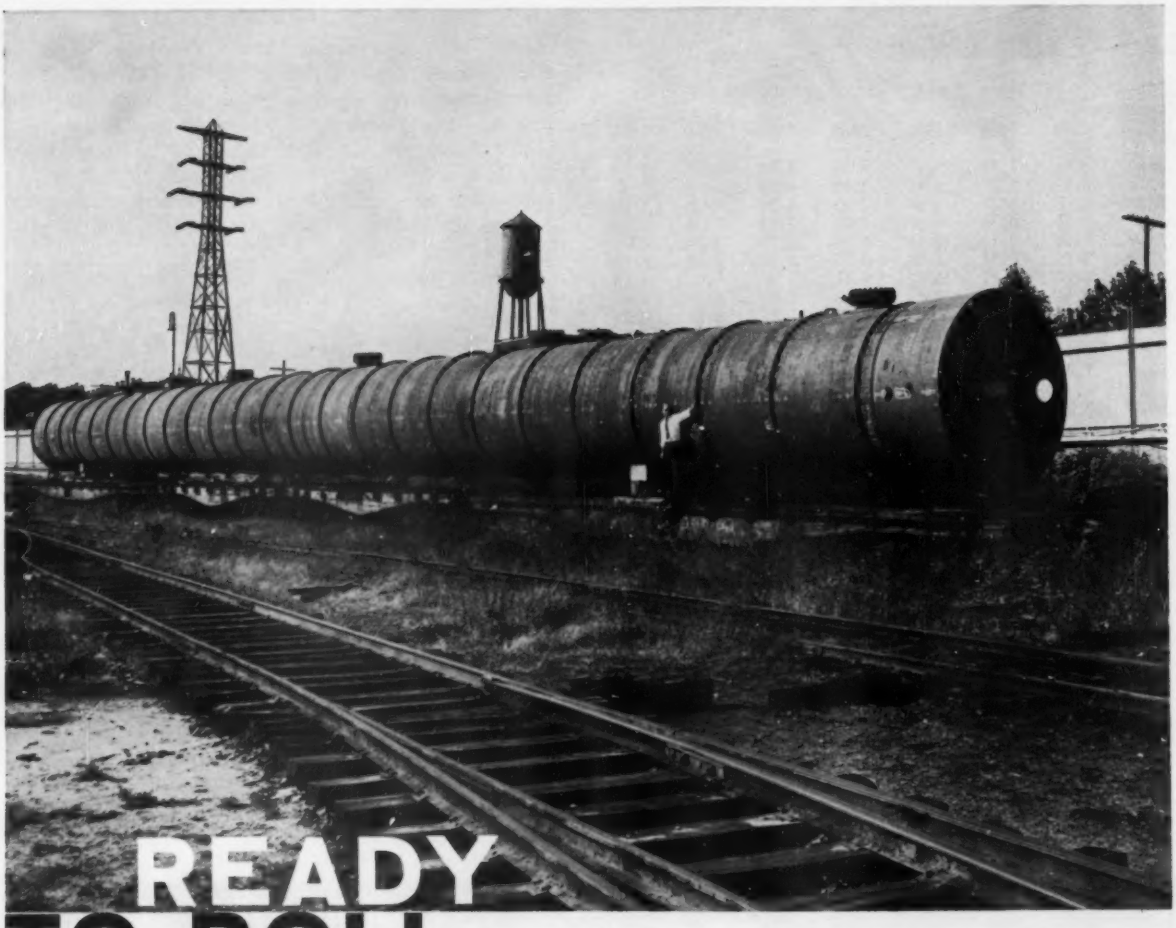

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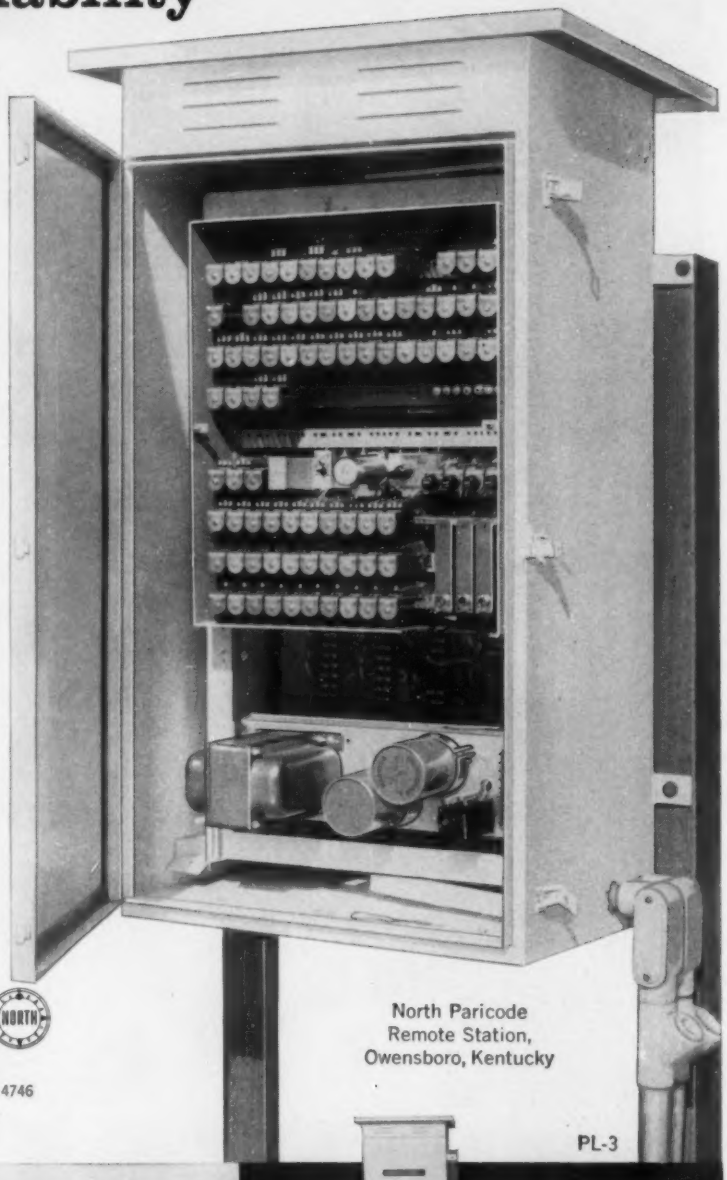

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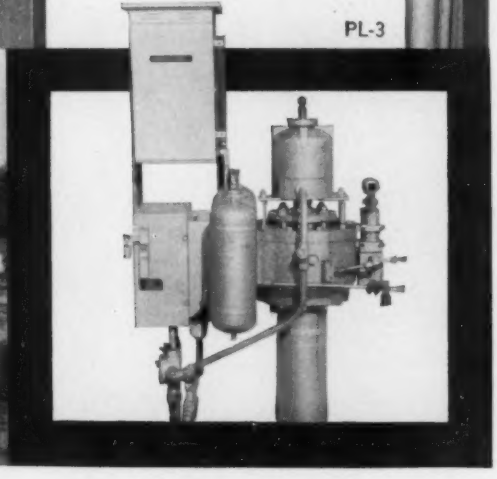
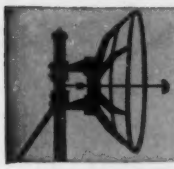
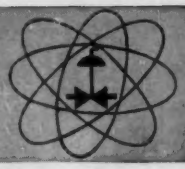
Remote Station,
Owensboro, Kentucky

PL-3





Communications and Automation



Edited by FRANK CHAPMAN

Which to use—microwave or leased line?

By VINTON LONG

THERE are a lot of microwave systems being installed for pipelines throughout the country and for the power utilities. Sometimes it is pretty difficult for management to decide whether or not it is better for the company to attempt to build its own microwave system. In the January 1960 issue of the *AIEE Journal*, S. C. Bartlett of the American Electric Power Service Corp. wrote an excellent article on microwaves and their use in power systems. I would advise all who are interested in microwave communications to obtain a copy of this.

Of course, the first thing that management has to figure out is whether or not it can afford a microwave system. On this subject Bartlett had an excellent series of charts, which are presented here as *Fig. 1*.

We pipeliners can ignore the line showing power line carrier in this case.

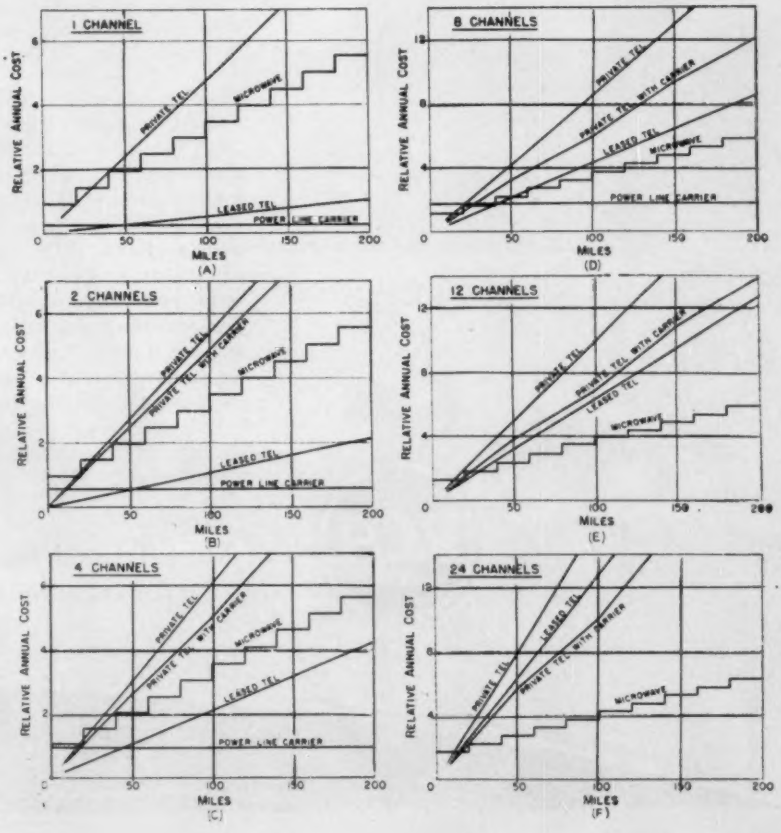
I note that they have had excellent results of 99.88 per cent reliability for the system, which is pretty good.

He mentions that ordinarily, new circuits which cannot be handled by their carrier current communication using their hi-lines would logically be applied to leased lines, and as the number of these circuits increased to the crossover point of 6 or 8 voice circuits in parallel, it is expected that they would then be replaced by microwave. They feel also that once the microwave is installed, many new applications will appear through having additional circuits available at a small cost. This includes data handling, facsimile, confidential or executive circuits, and, of course, telecontrol systems.

They feel that it is better to avoid a system upon a manufacturer's guarantee of overall performance, since this leads to overdesign. This I agree with also, and I also believe that the pipelines should do their own survey before putting any bids out for microwave equipment. By this I mean a field survey. Part of this comes from a realistic consideration of what would be done if performance guaranteed by the manufacturer should not come "up to snuff." It is unrealistic to conceive of removing the entire system and replacing it by one of another make, or to think of completely abandoning microwave. In other words, let the user tell the manufacturer exactly what he requires, and let the manufacturer provide the best possible equipment for this need.

Most of the time the cost of communications is in the order of 1 per

Continued on page 171



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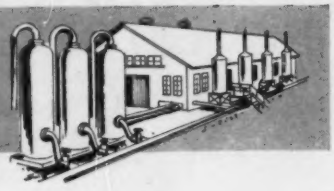
GAS PIPELINE NEWS



FPC nixes rate base cost of service

Federal Power Commission ruled it would not permit introduction of rate base cost of service evidence in the Permian Basin area natural gas rate proceedings on which conferences were held in mid-April in Washington. The commission said, however, that it would permit the introduction of cost data, as distinguished from "cost of service," for use in determining financial requirements of the natural gas industry.

At the first of the conferences held in Midland, Texas, in March, producers requested FPC to issue an order setting forth "with some particularity" the types of cost evidence which may or may not be introduced. The April 5 ruling appears to be an attempt to do this.

Producers had also asked for a "savings clause" at Midland, whereby individual producers could demonstrate reasonableness of individual filed rates, after the issuance of a final order determining area rates. FPC didn't rule on this, and deferred consideration until some later date.

The enchanting Enchilada Inch

On March 15, 16, and 17, California's Public Utilities Commission took another pass at hearing Application No. 42931—California Gas Transmission's (an associate of Tennessee Gas Transmission) plea for authority to construct the in-California portion of the famed Texas-Mexico-California pipeline that would deliver gas for Southern California Edison's power-generating plants. Summing these sessions into a few words: the thing grew even more complex.

The TGT interests documented their case very well, we thought. They had been asked to bring more specific displays of their plans, agreements, and supporting work to these three days of hearings. This they did.

Of particular interest was the testimony of Frederick A. Hough (pronounced Huff), chief gas engineer, Bechtel Corp., San Francisco. He said that it is his prediction that southern California will not have enough natural gas to supply consumers of the area during the summer months of 1963 even with the Rock Springs pipeline. He further concluded that with both the Enchilada Inch and Rock Springs projects functioning as now proposed, there will be no adverse impact on revenue requirements of Southern California and Southern Counties Gas companies in most normal years, 1965 and 1966 excepted.

However, as CalGas-TGT et al unfolded its case, protestants seemed to draw comfort and felt even more strongly that California's PUC could not approve both projects at this time. And they were encouraged by opposition to Enchilada Inch originating with Los Angeles County Federation of Labor, AFL-CIO and the California State Federation of Labor.

Outside the hearing dates, other matters of interest developed. First, before the 42931-hearings (on March 6), CalGas filed a motion with Cal-PUC to reopen Application No. 40588 (Amended), and to consolidate 42931 and Application 42932 (the related Southern California Edison application) with its comparative and simultaneous hearing and decision. The staff of California's PUC has also requested consolidation of the hearings.

Then, on March 20, California Gas Transmission filed a brief with the California regulatory agency that alleged the "original Rock Springs" and "new Rock Springs" projects were designed to block SoCalEd's efforts to secure its own firm source of gas. It also listed reasons why Rock Springs should be reopened and consolidated for comparison with the CalGas-SoCalEd applications.

There the matter rests until May 10-12, when the balance of applicants' direct evidence in support will be given to the record. The PUC has reserved May 17-19 for initiation of cross-examination by opponents.

Achtung!

If you are weary of U. S.-Canadian vs. U. S.-Mexican gas pipeline projects, a $20-million, 180-mile gas pipeline in Germany is open to U. S. bidders, according to the Department of Commerce.

The proposed line will run southward from Mannheim to Kehl. It will be constructed of steel pipe of 40-cm diam. for an operating pressure of 51 atmospheres. Interested firms should get in touch with Director Juergen Stech, Technische Werke Stuttgart in Stuttgart, West Germany. Herr Stech is a member of the managing board to Gasversorgung Sueddeutschland, a holding company formed by several Baden-Wuerttemberg cities, which is sponsoring the project.

Seeks court review

California and the state's PUC have filed a petition in the U. S. Supreme Court seeking a review of FPC's treatment of liberalized depreciation.

The petition asks the High Court to review the Aug. 2, 1960 judgment of the U. S. Court of Appeals insofar as it affirmed FPC's treatment of liberalized depreciation in a rate case involving El Paso Natural Gas Co.

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ANTI-AMBIENT RECORDER MEASURES GAS TEMPERATURE ONLY—

is unaffected by the weather

A variation of 10F in gas temperature causes an error of 1% in metered volume with an orifice meter. So why risk your profits with an unreliable gas temperature recorder that "picks up" ambient temperatures, too? Put a Foxboro Anti-Ambi Recorder on the line. You'll get a precise record of actual gas temperatures, regardless of weather conditions, regardless of ambient temperature range.

Here's why Anti-Ambi Recorders are more accurate. First: the measuring bulb has a small, stainless-steel neck — offers minimum area to ambient temperatures, minimum conduction. Second: the measuring system is fully compensated to your individual operating conditions — cancels out ambient temperatures at the case and along the tubing. Third: measurement is uniform — recorded directly on a uniform chart. And the whole instrument is designed for rugged service.

Protect your profits with Foxboro Anti-Ambient Temperature Recorders. They're perfect compliments to Foxboro's high-accuracy Gas Flow Meters. Write for details. The Foxboro Company, 345 Norfolk Street, Foxboro, Massachusetts.

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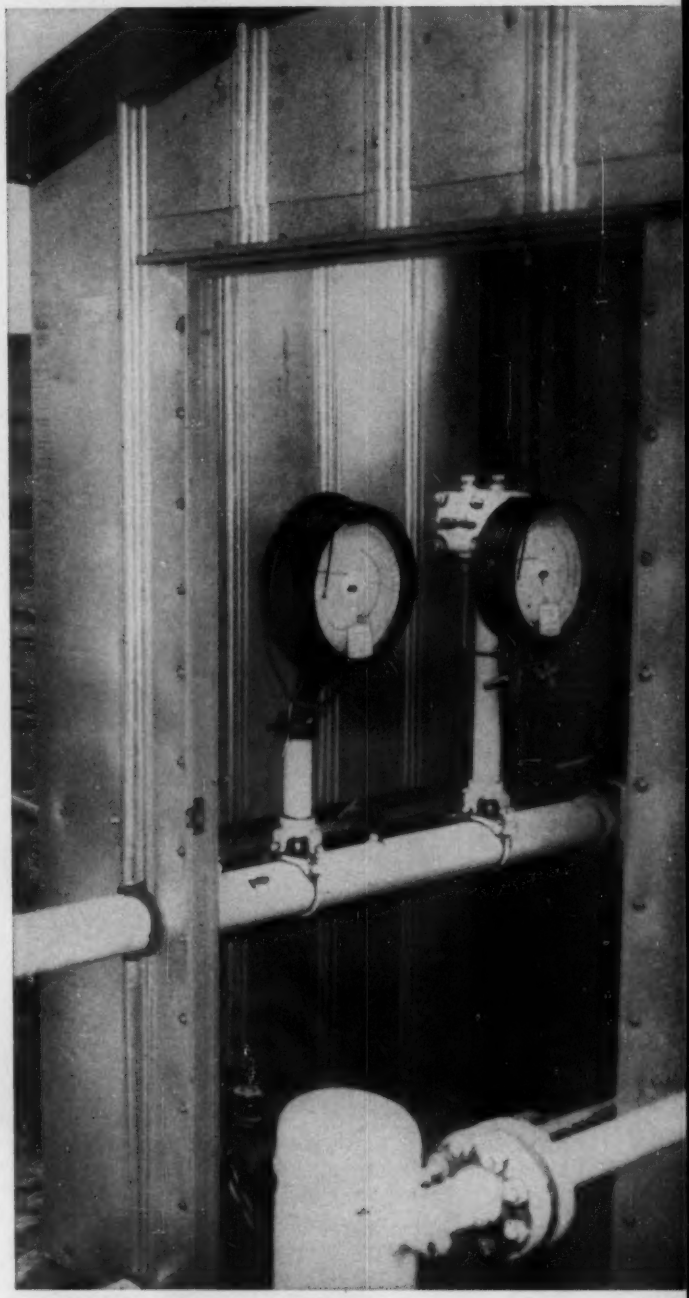

FOXBORO HIGH-PRECISION gas metering team in action at Transwestern Pipeline Company station, Parsell Field, Texas. Foxboro Anti-Ambient Temperature Recorder (left) and Foxboro T/37 Diaphragm Meter (right) measure purchased gas with "cash register" accuracy.

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A. O. Smith Corporation believes that the best coating results are obtained from an originally clean, pickled surface, and that coating applied to such a surface will yield maximum benefits to the user. To this end A. O. Smith has established newly designed and fully enclosed facilities for *separate* cleaning and *separate* coating of 16″ through 36″ line pipe at both its Houston and Milwaukee plants.

These modern coating facilities are typical of A. O. Smith's ability to manufacture line pipe to exact customer specifications. For your exact coating requirements, contact the A. O. Smith sales office near you.

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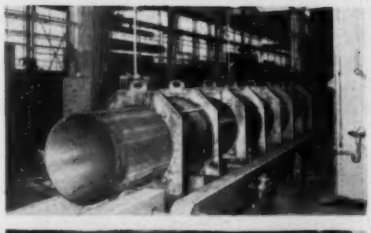

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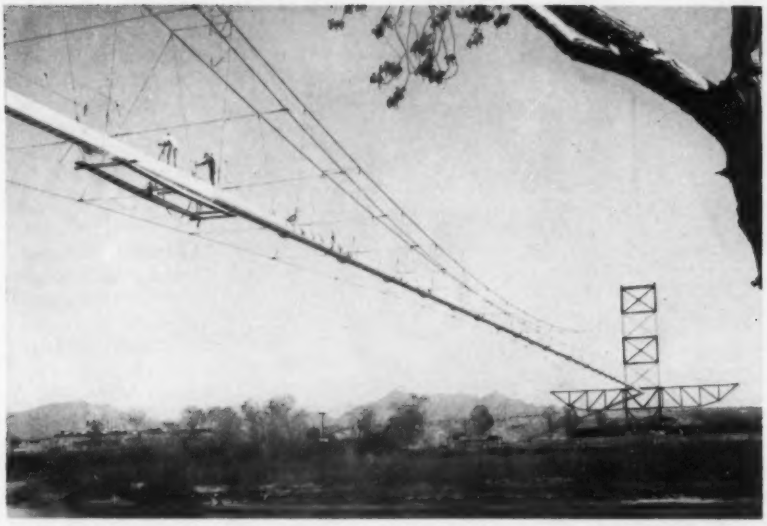


Undergoing a facelifting is the gas pipeline suspension bridge over the Colorado river at Blythe, Calif. The bridge, part of the southern Texas pipeline system, is owned jointly by Southern Counties and Southern California Gas companies, and El Paso Natural Gas Co. It will take about 45 days to paint the 1020-ft long, 30-in. structure. Two coats of white enamel paint are being applied. Painters work from a catwalk which rolls along the pipe, suspended from hand cables. This is the first time the bridge has been repainted since its completion in 1947.

Reserves hit 264 trillion

Natural gas reserves in the U. S. have reached an all-time high of 263.7 trillion cu ft. A joint API-AGA report said new reserve discoveries last year were the third largest on record, pushing untapped supplies to a peak — despite unprecedented levels of output.

The 263.7 trillion cu ft of natural gas reserves is 1.1 trillion above the 1959 total.

While Texas' natural gas reserves were declining about 3/4 per cent to 119.5 trillion cu ft, Louisiana showed substantial gains. Natural gas reserves there went up 6 per cent to 63.4 trillion cu ft.

Canada's natural gas reserves climbed 16 per cent to 4 trillion cu ft.

Northern Natural, Houdry join for fuel cell work

Northern Natural Gas Co., Omaha, and Houdry Process Corp., Philadelphia, have entered a joint venture to develop a natural gas fuel cell. Their goal is production of electricity right in homes and factories using a fuel cell taking basic energy from natural gas.

Fuel (natural gas in this case) and air are supplied to fuel cells. A catalyst performs an energy conversion, directly producing electricity. And, characteristically, according to Northern, the fuel cell has more than doubled the fuel efficiency of a conventional electrical generating system.

Houdry has pioneered in development and manufacture of catalysts. The company is particularly well known for development and marketing of the catalytic cracking process for refining crude oil.

Harris says his bill a boon

The most recent bill—relating to natural gas—introduced by Rep. Oren Harris (D., Ark.), House Committee Chairman, will

1. Increase membership of FPC from five to seven.
2. Permit a commissioner to serve as chairman of FPC at the pleasure of the President.
3. Allow the commission to divide itself into panels of three commissioners, with the chairman "floating" between when and if needed, or when handling matters of widespread significance.
4. Permit one commissioner to settle some matters.
5. Add one Democrat and one Republican to FPC, and raise the limit of commissioners from one party from the current three to four.

Harris said his bill would be a real boon to the gas industry because it would speed disposition of cases. He also pointed out that FPC now has its largest backlog of work in history and that something must be done.

The bill would also solve the problem of the chairmanship of FPC. Eisenhower appointee, Jerome K. Kuykendall, a Republican, seems disinclined to relinquish the position until his term runs out. President Kennedy, however, is trying to replace Kuykendall with a Democrat chairman.

FPC lowers Panhandle's rate of return

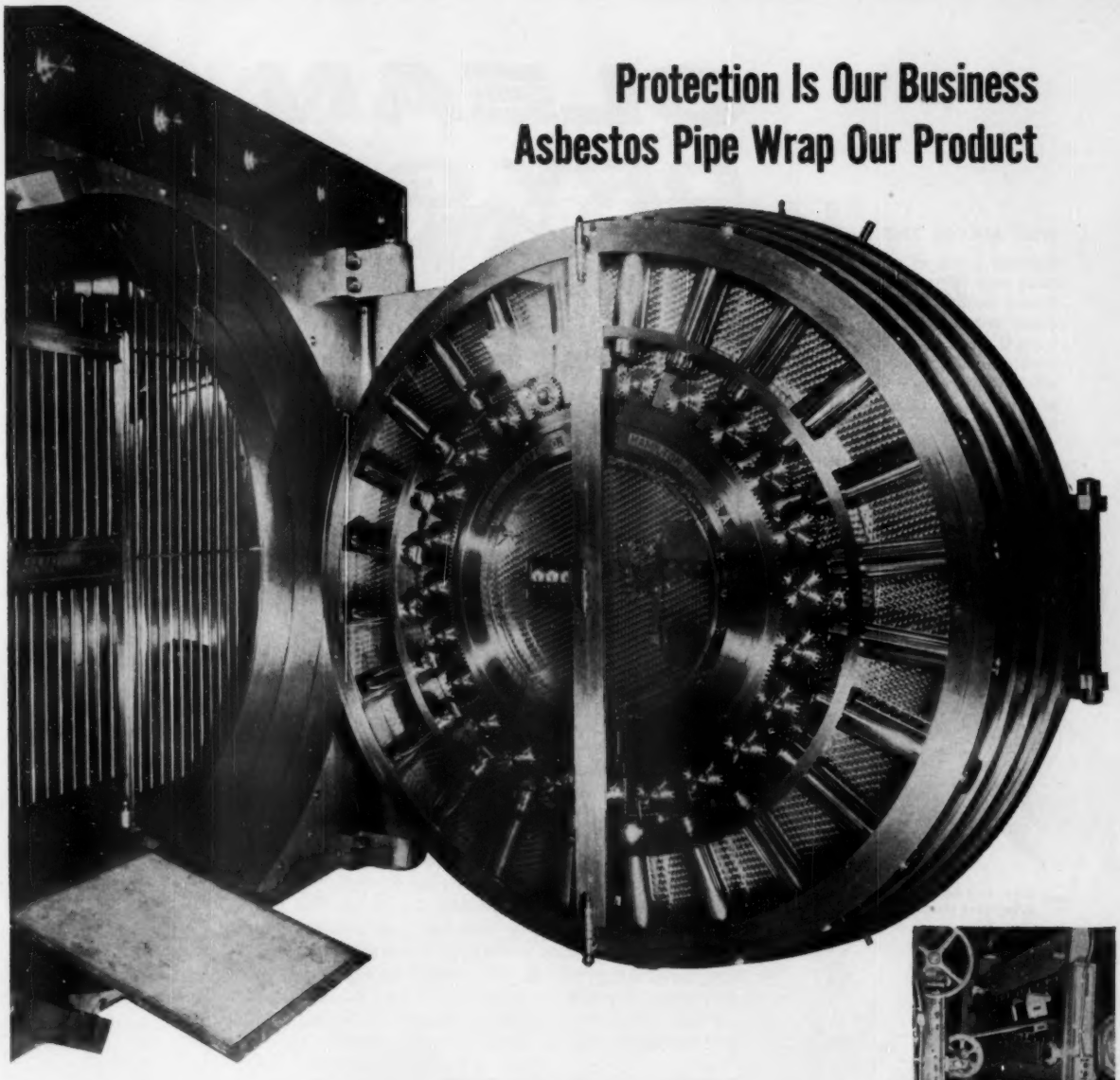
An interim order from FPC sets Panhandle Eastern Pipe Line Corp.'s rate of return at 6¼ per cent rather than the 7 per cent the company was claiming in a pending rate case.

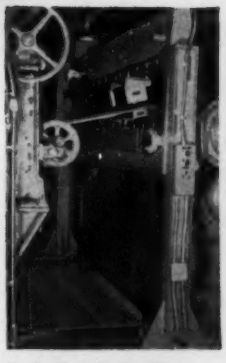
Panhandle is seeking an $8.6 million per year increase. The higher rates were in effect subject to refund from March 26 until July 1, 1960. Then they were superseded by a further proposed increase.

In determining that 6¼ per cent is a "fair, and just and reasonable" rate, FPC allowed a 10.47 per cent return on equity. This compares with 11.76 per cent claimed by Panhandle.

Panhandle was allowed a 1.5 per cent return on deferred income tax accruals in accordance with rulings FPC made in the Northern Natural Gas Co. and Kansas-Nebraska Natural Gas Co. rate case opinions.

Protection Is Our Business
Asbestos Pipe Wrap Our Product





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The protection of pipe lines is a major concern with Nicolet Industries. Every product that bears the name of Nicolet is the finest of its kind. That is why **Nicolet Asbestos Pipe Line Felts** and **Nicolet "Old Nic" Glass Wrap** are so widely used and specified. ■ To continue to merit the confidence placed in Nicolet Pipe Line Felts and Glass Wrap, Nicolet Industries maintains the most rigid of Quality Control Systems. From our Asbestos Mines to finished products, you are assured of complete adherence to specifications. ■ More and More Corrosion Engineers are specifying Nicolet Asbestos Pipe Line Felts and Nicolet "Old Nic" Glass Wraps. You, too, should write today for samples and specifications.

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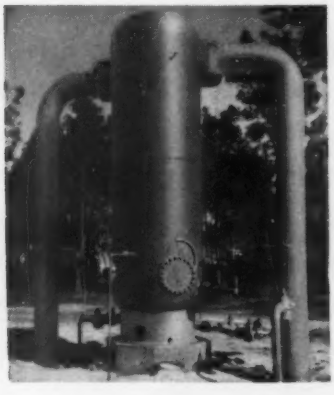
Cleaned gas outlet.
Swirl in center shows upward spiral of cleaned gas.
Downward path of liquid and dust.
Dust, liquid and gas inlet.
Dust and liquid ejected to tube eject plenum reservoir.

A Dry Gas Scrubber designed to remove liquid slugs and bulky solids as well as pipeline dust will protect all equipment and controls in your system and provide the maximum user satisfaction. ■ The Blaw-Knox Type D-LS combination Dry Gas Scrubber and Liquid Separator does just that. ■ It is a new and different type of scrubber that incorporates miniature cyclone tube separation—an inlet expansion separation plenum to separate bulky solids and liquid slugs, before they can plug up the tubes—a solidly welded tube bank into which the clean, dry gas is separately discharged—a tube eject or outlet plenum into which the cyclone tubes eject the solids and liquids they have removed. ■ We would like you to know more about our new scrubber. Write for Catalog No. 394—or ask for our representative to call. Buflovak Equipment Division, 1547 Fillmore Avenue, Buffalo 11, N.Y.



A 54" Blaw-Knox Type D-LS Combination Dry Gas Scrubber and Liquid Separator installed at a main line compressor station in Louisiana. It is removing dust and hydrocarbon condensate from an extremely wet natural gas. It is estimated that the sale of the reclaimed condensate will pay for the scrubber in a few months.

Buflovak Equipment Division

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Blaw-Knox designs and manufactures for America's growth industries: METALS: Rolling Mills • Steel Processing Lines • Rolls • Castings • Open Hearth Specialties • PROCESSING: Process Design, Engineering and Plant Construction Services • Process Equipment and Pressure Piping • CONSTRUCTION: Concrete and Bituminous Paving Machines • Concrete Batching Plants and Forms • Gratings • AEROSPACE: Fixed and Steerable Antennas • Radio Telescopes • Towers and Special Structures • POWER: Power Plant Specialties and Valves

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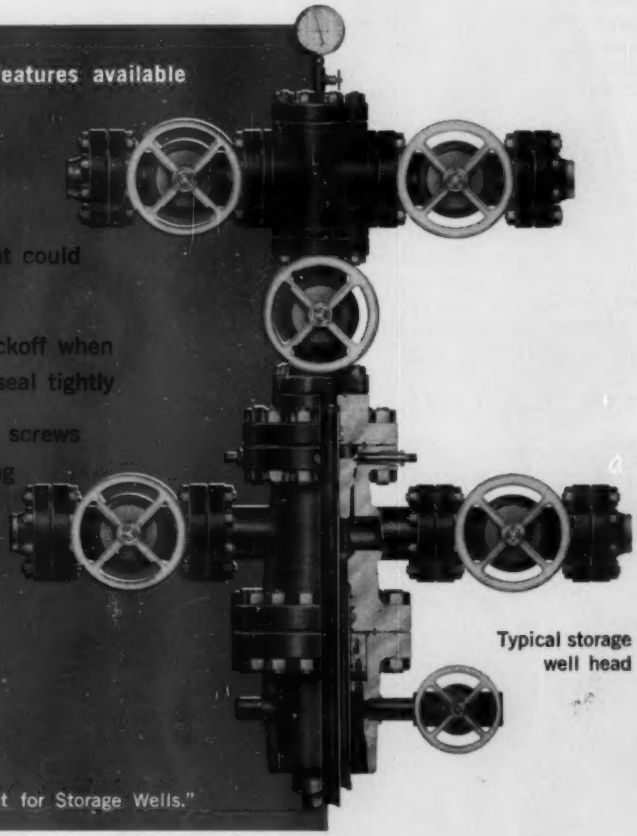
OCT engineering has provided effective solutions to the problems of equipping LPG and natural gas storage wells for several years. This wide experience goes to work for you with every OCT Christmas tree you install.

Here are some of the OCT well-head features available to solve storage problems:

- a full range of well-head equipment to handle any need
- flanged connections to stop leakage that could occur at screwed connections
- lockdown screws to provide positive packoff when shallow casing strings are too light to seal tightly
- threaded casing hangers with lockdown screws to prevent vibration from loosening casing and allowing it to fall
- strippers to permit casing movement during cavern-washing operations
- the large well-head equipment needed to meet typical storage-well needs

Write for our booklet "O-C-T Well-Head Equipment for Storage Wells."



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Fuel study plans progress

Several resolutions have been introduced in the current Congress relating to the development of a national fuels policy. Some called for creation of a joint Senate-House group to conduct the study. Others provided for a special House committee to undertake the task. The latter course of action has received favor.

Approved by the House Rules Committee and sent to the House is HR 183. It calls for creation of a select committee on a national fuels study to be composed of 15 members of the House of Representatives to be appointed by the Speaker. The committee would make a study of current and prospective fuel and energy resources and determine the need for a national fuels policy.

The committee would consider:

(1) The proved and predicted availabilities of our national fuel and energy resources in all forms, and factors pertinent thereto;

(2) Projected national requirements for the utilization of these resources to meet immediate demands and to provide for future expansion of the economy;

(3) The interests of the consuming public, including the availability in all regions of the country of an adequate supply of various fuels at reasonable prices and including the maintenance of a sound competitive structure in the supply and distribution of fuel to both industry and the consuming public;

(4) Technological developments, in progress and in prospect, including desirable areas for further exploration and technological research.

(5) Governmental programs and policies now in operation, including not only their effect upon the individual fuel and energy industries, but also their impact upon related and competing fuel and energy industries, but also their impact upon related and competing fuels and their interaction with other governmental programs;

(6) The need, if any, for legislation designed to effectuate recommendations in accordance with the above and other relevant considerations, including proposed amendments to such existing laws as the Federal Power Act, the Natural Gas Act, and the Atomic Energy Act of 1954 necessary to integrate existing laws into an effective national fuels program.

TGT plans 33-story building in Houston

The new office building to be built in downtown Houston as headquarters for Tennessee Gas Transmission Co., and its associated companies, will be a gleaming 33-story tower faced with glass and anodized aluminum (see photo). It will measure 195 ft square and rise 475 ft above ground level.

Owner of the building will be Tennessee Gas Building Corp., which also owns the 250-ft square block the building will occupy.

The ground floor will be devoted completely to pedestrian circulation and to a glass-encased lobby. The plaza area will be finished in natural stone and landscaped.

Office areas will surround a service core rising through the center of the structure. Unusual flexibility in laying out office space will be permitted by the absence of intermediate supporting columns in office areas and a modular unit design concept.

Northern's return cut to 6¼ per cent

An interim order from FPC reduced Northern Natural Gas Co.'s desired rate of return from 6-3/4 per cent to 6-1/4 per cent.

Northern has to file a new rate reflecting the reduction. Also due is a plan for refunding to its customers the excess amounts Northern has been collecting since Dec. 29, 1959. The increase amounted to some $9.8 million a year.

The commission's opinion does not contain a computation of the reduction or of the amount of the refund. However, FPC staff computations indicate that the reduction in rate of return and associated income taxes will result in a cut of about $3.4 million in Northern's claimed jurisdictional cost of service for the test year 1960. Since Northern's suspended rates would have recovered about $3.1 million less revenues from its jurisdictional sales than the costs it claimed, the net effect of the action will be to require Northern to refund about $300,000 per year.

Rehearing scheduled on Transco plan

On May 15, FPC will open hearings on a large group of applications relating to sales of gas which will ultimately go into Transcontinental Gas Pipe Line Corp.'s system.

Included in the proceedings: A rehearing of an FPC order issued last November authorizing South Texas Natural Gas Gathering Co. to sell up to 70 MMcfd to Transco.

The order also authorized 41 independent producers and one pipeline company to sell gas to South Texas for resale to Transco. Transco was granted a certificate for the construction of pipeline facilities.

On Jan. 19, FPC granted the New York PSC's application for a rehearing of the November order. The commission intervened, seeking a lower initial price than proposed by the producers and pipeline company which sell to South Texas. Initial price of the gas as authorized by FPC ranged from 9 to 17 cents per Mcf.

In the meantime, however, South Texas filed an amendment to its application seeking authority to up the volume of deliveries to Transco from 70 million to 140 MMcfd.

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Spiral or cigarette-wrap method, the job goes faster and easier with J-M Duratape. This wrap is exceptionally pliable, yet is strong and tough to resist tearing during application. And Duratape is a *complete* wrap; it needs no extra coating for reinforcement.

Duratape, developed especially for hot wrapping, is made of non-organic glass fibers, heavily coated with coal tar or asphalt enamels. It bonds tightly with the pipe, forming a continuous, integral surface that protects against electrolytic currents and other causes of steel pipe corrosion.

For the most protection per dollar, for enduring resistance to underground corrosive elements — always specify J-M Duratape Joint Wrap. And for complete information, see your J-M representative or write to Johns-Manville, Box 158, Dept. GS, New York 16, N. Y. In Canada: Port Credit, Ontario. Cable: Johnmanvil.

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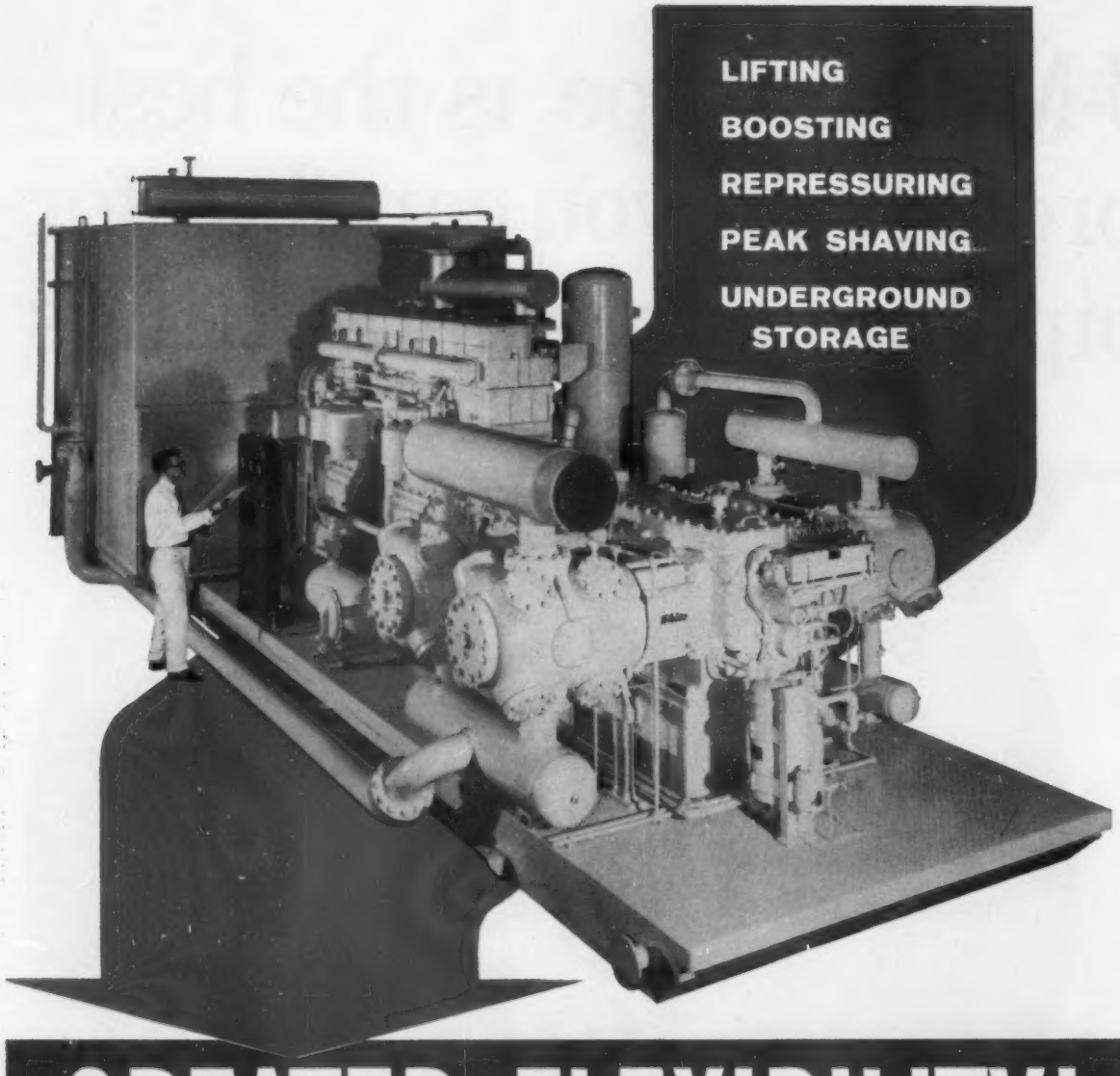

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Two, four and six-cylinder models offer cylinder sizes from 4000 psi, 2⅝" dia. to 85 psi, 22½" dia. providing 68 different standard cylinders. Custom sizes and designs are available.

These continuous, heavy-duty units also provide wide speed range, manual or fully automated station operation, and they can be block mounted or skidded and unitized to facilitate moves for service changes. Get complete information now . . . write for Bulletin 124. White Diesel Engine Division, Springfield, Ohio.

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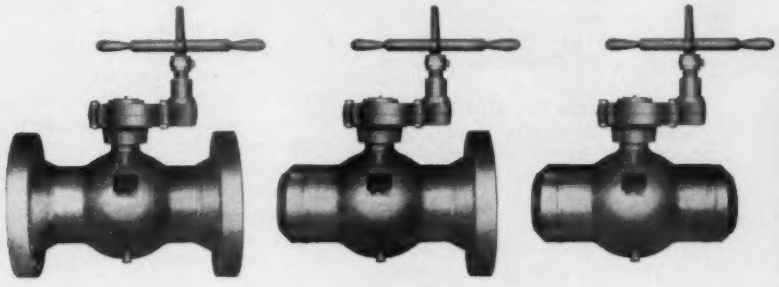

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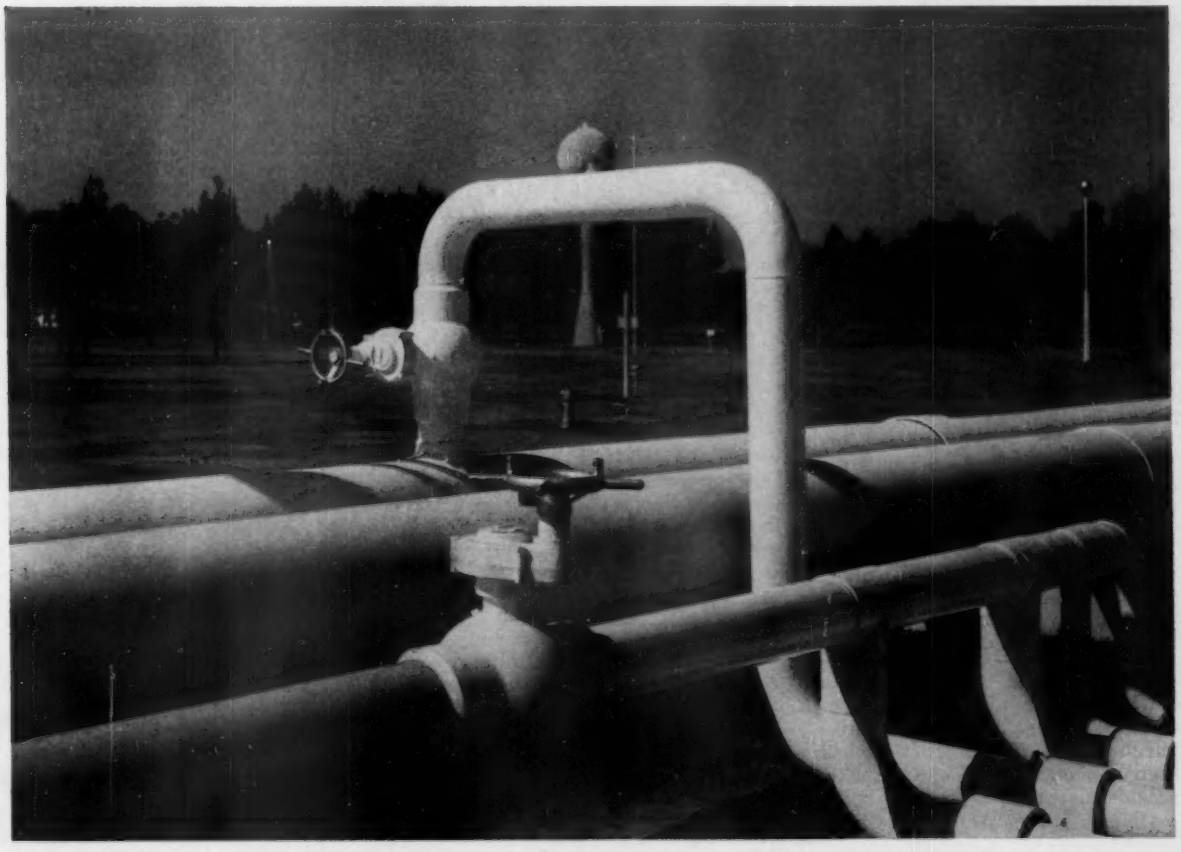


Interruptible sales go to distributor

Southern Natural Gas Co.'s plan to supply interruptible gas service to two Savannah, Ga. companies was turned down by an FPC presiding examiner.

Service to the companies — the Ruberoid Co. and National Gypsum Co.—should be made by the local distributor, South Atlantic Gas Co., the examiner said. "In principle," he said, "lines of interstate transmission companies should not be laid down on top of local distribution lines for the service of profitable industrial load that can be served by the local distributor."

Examiner Robert M. Weston called an agreement between Southern and South Atlantic to divide the industrial service area "invalid and ineffectual."

It is not for Southern, with or without distributor acquiescence, to determine who serves the industries in a given area, Weston said. This is done by FPC on standards of the public interest directed to consumer protection and benefit, he continued. "The commission cannot be placed in the position of giving sanction, expressed or implied, to arrangements which are in principle bad for consumers, merely because the arrangements seem expedient to the parties."

Weston said service of the industrial load by South Atlantic would benefit Southern's load factor and assist in meeting minimum takes to the same extent as the proposed direct sale. The essential difference from the consumer point of view is that the sale by South Atlantic would be subject to the jurisdiction of the Georgia commission. Any benefits would presumably accrue to South Atlantic's domestic consumers.

Revenues from the direct service proposed by Southern, the decision said, would be nonjurisdictional profits over and above Southern's rate of return as determined by FPC.

During the hearing, South Atlantic, at the direction of the Georgia PSC, said it could undertake the proposed industrial services if freed from restrictive agreements in its tariff with Southern.

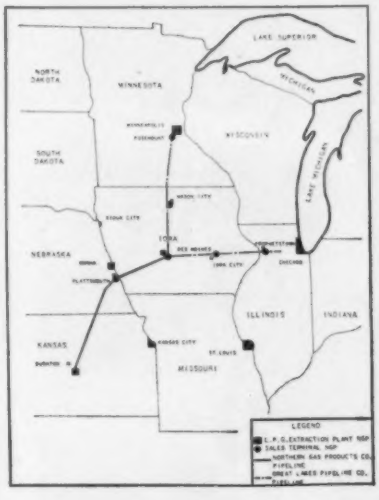
Northern, Phillips join to market LPG

Phillips Petroleum Co. is joining Northern Gas Products Co. in marketing propane gas.

Northern Gas Products, subsidiary of Northern Natural Gas Co., plans to build a 350-mile, 8-in. LPG pipeline from its natural gas liquids extraction plant at Bushton, Kan., to Des Moines, Iowa. At Des Moines, it will connect with the pipeline system of Great Lakes Pipeline Co.

Six pipeline terminals will be built at Plattsmouth, Neb.; Des Moines, Mason City, and Iowa City, Iowa; Rosemount, Minn.; and Prophetstown, Ill. Phillips will buy the propane at these terminals for distrbution in the Northern Plains area.

The pipeline, with an ultimate capacity of 40,000 bbl per day, and the terminals represent an investment by Northern of about $12 million.



Marketing group set up

A new plant for nationwide marketing of products of the Protective Coatings division of Pittsburgh (Pa.) Chemical Co. has been announced by W. K. Menke, president.

Division marketing has been organized into two sections—industrial coatings section and pipeline coatings section. Industrial coatings markets a full line of tarmastics, Tarset, and insulmastics protective coatings. Pipeline coatings section serves the pipeline industry with primers, enamels and associated products.

FPC hears NGPL construction plans

Natural Gas Pipeline Co. of America is presenting its proposal to spend $52.3 million on new facilities to FPC.

With the new facilities, NGPL could increase the daily design system sales capacity of its Natural division to 870 MMcf, an increase of 40 MMcf. Capacity of its Gulf Coast division would be hiked 120 MMcf to 729 MMcf. The additional capacity would go to 17 existing customers in Illinois, Indiana, Iowa, Wisconsin and Oklahoma.

Included in the construction plan: 285 miles of 30-in. pipeline loops; 60 miles of 36-in. loops; 22.5 miles of 8-in. laterals; 64,200 additional compressor hp; various river crossings; five metering stations; and appurtenant equipment.

Construction would be in Illinois, Texas, Arkansas, Kansas, Nebraska, Iowa, and Missouri.

Gasmen to study transmission facilities

Prominent gas and oil representatives have been named to the National Petroleum Council's committee on oil and gas transportation facilities.

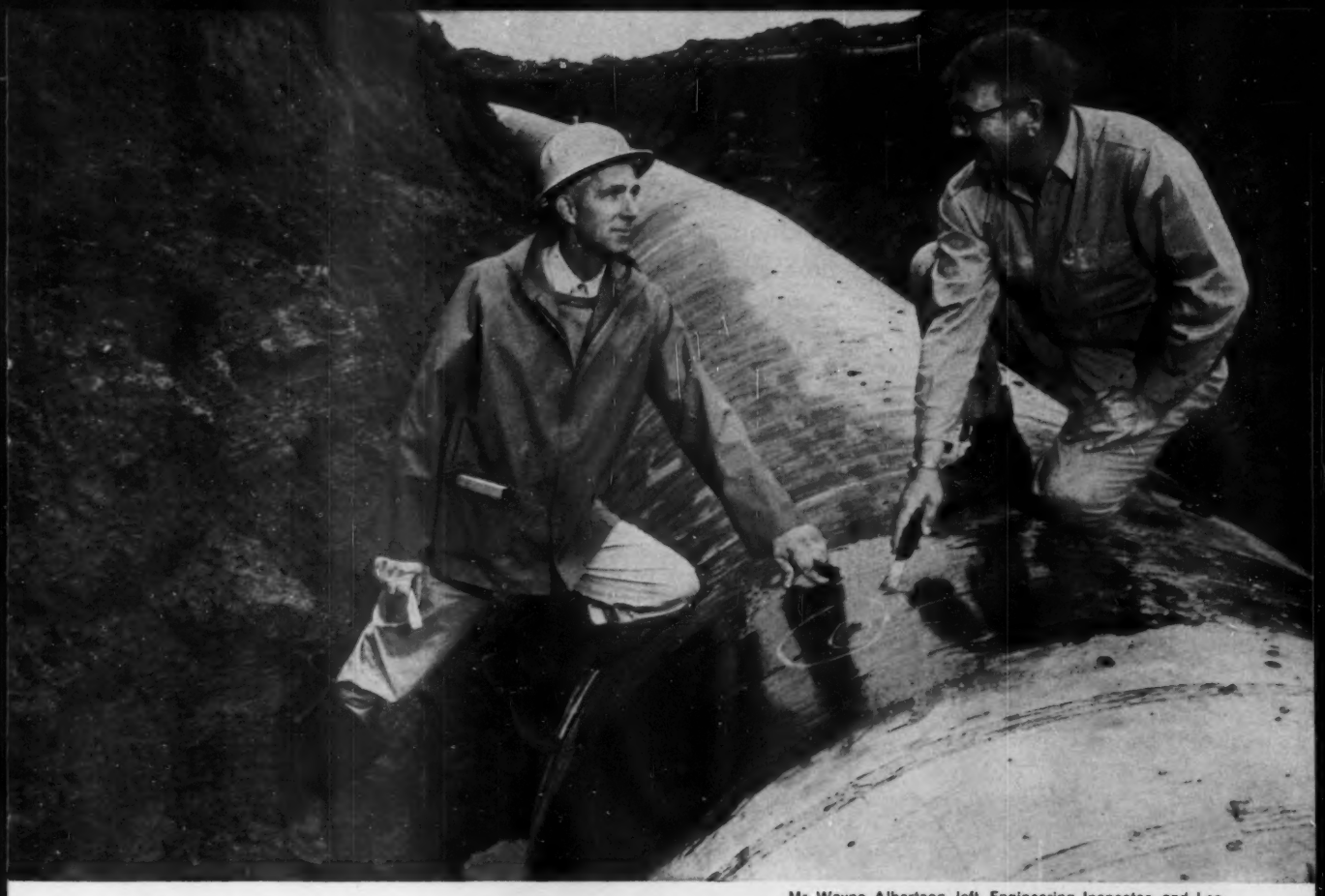
The transportation committee will undertake a study to determine the petroleum and gas transportation capacities as of Jan. 1, 1961. Included are natural gas transmission lines.

Among members of the committee are: Orville S. Carpenter, president, Texas Eastern Transmission Corp.; James Comerford, chairman, Consolidated Natural Gas Co.; George R. Copeland, president, Algonquin Gas Transmission Co.; Paul Kayser, chairman, El Paso Natural Gas Co.; Ed Parkes, president, United Gas Corp.; and George S. Young, chairman, Columbia Gas System.

Mines storage cavern

Texas Eastern Transportation Corp. is mining a 150,000-bbl underground propane storage cavern at the Little Big Inch terminal at Princeton, Ind.

The cavern and loading facilities will serve the tri-state area of southeastern Illinois, southwestern Indiana, and Northern Kentucky. It will be completed for the 1961-62 propane season.



Mr. Wayne Albertson, left, Engineering Inspector, and Leo Crowder, Koppers serviceman, inspect the pipeline coatings.

"It pays to have a Koppers serviceman on these really big pipeline jobs"

That's how Wayne Albertson, Engineering Inspector for Black & Veatch, Consulting Engineers of Kansas City, evaluated Leo Crowder's work as a Koppers serviceman on St. Paul's new gigantic pipeline project. This 90" steel waterline will carry 90 million gpd of fresh water four and one-half miles from Lake Vadnais to St. Paul's filtration plant.

Mr. Albertson stressed the importance of having a coating specialist present on the job. He said, "A pipeline is only as good as the protective coating job; and the best assurance of top-rate coating protection is to have a specialist on hand who has worked with these problems before. He can often quickly solve pipeline coating problems that might consume days of our time."

Each of the mammoth pipe sections welded together on this installation was shop coated with Bitumastic® 70-B AWWA Primer and Enamel, and wrapped by Bethlehem Steel Company before shipment to St. Paul. Following the welding operation, the pipe joints were given another heavy coating of Bitumastic 70-B AWWA Enamel and glass and felt wraps to give the joints permanent protection against corrosion.

A Koppers serviceman can show you how to get long-range corrosion protection with Bitumastic protective coatings. For more information on the complete Koppers coating line, mail the coupon or write: Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, Pittsburgh, New York, Woodward, Ala., and Houston, Texas (Mavor-Kelly Co.). In Canada: Koppers Products, Ltd., Toronto, Ontario.

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Gentlemen:
I would like a copy of your booklet on pipeline coatings, "How Long Should A Pipeline Last?"

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Hearings under way

Hearings are underway on American Louisiana Pipe Line Co.'s plan to build 25 miles of 8-in. line to connect Holly Ridge field in Tensas parish, La., to its main transmission system.

American Louisiana will buy gas from five producers in the field: Pan American Petroleum Corp., Union Producing Co., Socony Mobil Oil Co., Humble Oil & Refining Co., and Tidewater Oil Co.

American Louisiana estimates that the dry recoverable gas reserves committed to it by the producers amount to about 30 billion cu ft.

Southern adds new customer

FPC adopted a presiding examiner's decision authorizing Southern Natural Gas Co. to sell gas to a new customer, Carolina Pipeline Co., Columbia, S. C.

Southern will deliver 7.5 MMcfd for the first year of operation, scheduled to begin Nov. 1. Deliveries will increase to 10.3 MMcfd.

Carolina, until now supplied solely by Transcontinental Gas Pipe Line Corp., will be able to begin natural gas service in Conway, Georgetown, Myrtle Beach, Winnsboro, and Bethune, S. C.

Coming out of the Kootenai river in northern Idaho is this section of 36-in. pipe, part of the 1400-mile Alberta-California gas pipeline of Pacific Gas & Electric Co. The capped pipe, gunited to overcome buoyancy and provide protection from rocks on the river bottom, has been eased into its 1000-ft trench. Workmen of River Construction Co. are preparing to pull the end into a casing beneath a railroad bed on the south bank. The Idaho-Washington-Oregon section of the line is being built by Pacific Gas Transmission Co.

Walworth Co., New York, plans to acquire Uni-Flex Manufacturing & Engineering Inc., Los Angeles. The agreement, subject to final audit, would involve an exchange of stock as well as a note issue. Uni-Flex makes piping and vessels used in the gas and electric industries.

Pipeguard Inc., Atlanta, Ga., is exclusive sales agent in five southern states for pipeline enamels and associated pipeline materials of the Protective Coatings division, Pittsburgh (Pa.) Chemical Co. States include Florida, Georgia, Alabama, Tennessee, and South Carolina.

Union Texas Natural Gas Corp. is building a gasoline plant near Haughton, La. The Sligo plant will have a capacity in excess of 150 MMcfd of gas. It will produce about 125,000 gal. per day of natural gas liquids.

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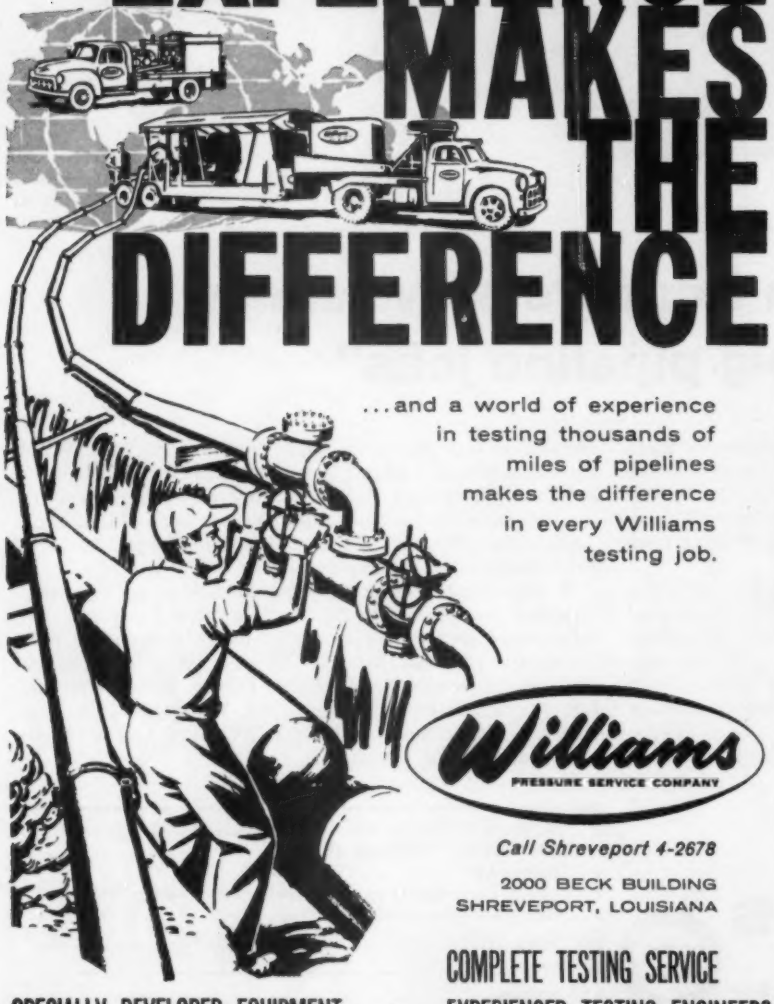

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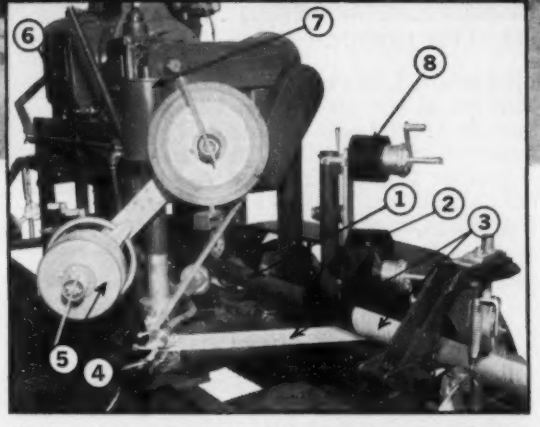

Pipe (coming toward you) spins through machine . . . undergoes dynamic cleaning from twin-powered brush heads. Coating comes off brake-type tape drum. Outer wrapping runs through fast-gluing adhesive attachment.

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2. Polyken tape coating
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7. Glue tank
8. Stand-by tape turret

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Your protective coating results are only as good as the material you use and the way you put it on. And with Polyken tape . . . plus the special, new Polyken way of on-site application . . . you get a combination that really does a perfect job —*simply, speedily, economically.*

Simplicity? Right! The completely mobile machine sets up in an hour (knocks down in half that time), uses 6 men or less for continuous cleaning, coating, and wrapping. Speed? You can process up to 20,000 lineal feet a day, take 10-minute breaks to switch pipe sizes. Economy? Look at it this way: You get *quality* tape, properly applied by a high-speed *quality* process. The result can't help meaning more *dependable* coating for your dollar.

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Tulsa, Oklahoma
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Cal-PUC gives PG&E 6.25% rate of return

California PUC allowed Pacific Gas & Electric Co. a rate increase that will boost typical residential customer bills by about 34 cents a month. The $4.8 million boost (to 1.69 million gas customers) is 63 per cent below that sought by PG&E.

The commission turned down the San Francisco company's request to transfer $3.9 million in recent rate increases from interruptible to firm gas customers. PG&E contended that high interruptible rates would cause industrial customers to turn to other fuels on a year-round basis.

The $4 million transfer plus the $13 million in other increases according to the PUC, would have given PG&E a 6.8 per cent rate of return. The increases granted give the company a 6.25 per cent return, the commission said.

Minneapolis fights state regulation

Minneapolis city councilmen are fighting a Minnesota state legislative bill calling for statewide regulation of gas, electric, and steam utilities.

The city officials say that if the bill is enacted, the city stands to lose about $1 million it now receives in street-use payments from Minneapolis Gas Co. and Northern States Power Co.

The council's bipartisan legislative committee also said enactment of the regulatory bill would raise rates in Minneapolis.

Under the bill, the state Railroad & Warehouse Commission would regulate utility rates through the fair value theory.

NI-Gas launches Troy Grove expansion

Drilling is under way as Northern Illinois Gas Co.'s first step to expand its Troy Grove underground storage reservoir. Twenty-one wells will range from 1200 to 1800 ft in depth.

NI-Gas vice president M. G. Markle said the wells not only will provide vital data, but some will be used for injection and withdrawal of natural gas.

A successful 20-hour test of the present Troy Grove facilities showed that up to 170 MMcfd could be withdrawn. Markle believes the current development could double storage capacity at Troy Grove, which now has about 12 billion cu ft of storage gas.

SoCal, SoCounties winning billboard

Three first-place awards were won by Southern California and Southern Counties Gas companies in the 9th annual Local Outdoor Advertising Contest. One of the winning billboards is shown in the accompanying photo.

Directing the campaigns for the gas companies were advertising managers J. S. Spaulding of SoCal and D. B. Robertson of SoCounties.

Sponsor of the contest is Outdoor Advertising Association of America. The Los Angeles office of McCann-Erickson Inc. handles the joint advertising account.

Thermoelectric generator fires gas furnace

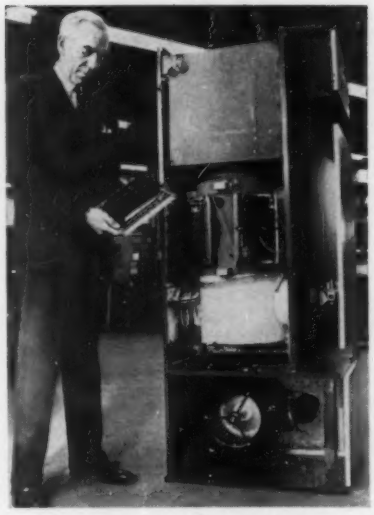
What is believed to be the largest thermoelectric generator ever applied to a residential heating system is being used in a new gas furnace developed by C. A. Olsen Manufacturing Co.

Company president Ronald N. Campbell said the thermoelectric generator, rated at 130 watts, converts heat from burning gas directly into electricity, producing sufficient power to drive a full-sized blower in the furnace.

Campbell pointed out that inherent characteristics of the thermoelectric generator make it possible for the new furnace to achieve a more constant and uniform air temperature in the home.

"When the furnace goes on, power from the generator builds up gradually, starting the blower at a low speed and slowly increasing it," he said. "As a result, air delivery to the floor registers will increase gradually both in velocity and temperature, until the maximum operation of the furnace is attained."

The Olsen company's objective is to produce a central heating, forced air furnace with its own source of power using a commercially available blower, while at the same time complying with AGA standards.



R. N. Campbell, president of C. A. Olsen Manufacturing Co., holds one of four thermoelectric generator modules used in the new furnace.

During recent tests on an experimental unit, the thermoelectric generator produced 130 watts at approximately 9 volts. The heating capacity of the unit is 80,000 Btu, "largest ever achieved by a thermoelectric furnace," Campbell said.

The thermoelectric generator itself consists of four trays or "modules," 8¼-in. high by 4¼-in. wide and 2½-in. deep. Each contains 47 thermocouples. Spaced at intervals, these modules are installed in openings in the shell of the combustion chamber.

Under this arrangement, the "hot" side of the module becomes an integral part of the combustion chamber. Fins on the opposite side of the module are cooled by the same air that is heated by the furnace and moved through ducts into the rooms of the home.

OFG drills 32 new wells

Ohio Fuel Gas Co. will put more than half a million dollars into drilling 32 new gas storage wells this year. The project is part of the company's continuing effort to expand and improve its underground storage program.

With the new wells, OFG's peak-day deliverability from storage will be boosted by some 22 MMcf.

KEYSTONE Asbestos Felt from Midwestern

High-speed wrapping and long-time protection are among the outstanding features of Keystone Keybestos pipeline felt. A parallel reinforcement of glass yarns on ¼" centers makes Keybestos especially suitable for high speed application . . . with fewer breaks . . . fewer holidays. The tough Keystone coating resists damaging impacts during handling, lowering-in and backfilling . . . and the material is specially engineered to withstand the attacks of corrosive soil acids.

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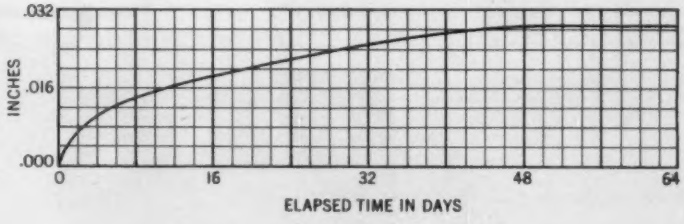
NEWS FROM DOWN THE LINE!

Are all pipeline insulators as alike as two peas in a pod?

They're not alike, not in physical properties! When plastic insulators first became available for pipeline use, WmSON felt they were inferior to the steel and block types then available. We delayed our entry into the field until we could provide a plastic material to withstand field abuse and wear. We found that material in a high density polyethylene which could be injection molded to provide low cost insulators of the highest quality.

Our decision has proved sound. Breakage and excessive wear of glass fibre reinforced plastics, particularly in large sizes, has created a lack of confidence in plastics in general, but the M-2 Plastic THINsulator® has proved its stamina. Its high resistance to cold flow has been proved. Deflection test results: 1000 p.s.i. on each THINsulator runner for 64 days — total cumulative deflection only 0.029". Max. temp. during test, 105° F., min. temp., 75° F.



Its low coefficient of friction causes it to slide easily inside casing. The M-2 is completely resistant to impact fracture (4.0 ft. lbs./in. notched) and has successfully worked on 36" pipe, ½" wall, pulled in excess of 500 feet. We are convinced that it will perform as well or better than any other insulator on the market, including all known steel types. Other physical properties: *Dielectric strength* — (short time, ⅛" thickness) 500 volts per .001 inches (D149-55T); *Tensile strength* — 4400 p.s.i. at 20 in./min.; *Elongation* — 25% 20 in./min.; *Abrasion resistance* — Taber index 5.7.

The increased acceptance of the M-2 THINsulator has brought production to a level of real economy in injection molding. These cost savings are being reflected in new WmSON prices for 1961.

In planning '61 cased crossings, don't pay a premium for other insulators — use WmSON engineered M-2's and save!

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New Mexico voters must make choice

New Mexico residents will vote on the proposed merger of the state's public service commission into the state corporation commission.

The proposal would set up a new five-member SCC appointed by the governor. It would regulate all public utilities and common carriers.

Under present New Mexico law and constitutional provisions, the PSC regulates electric, water and gas utilities, while the SCC governs rail, motor, transport, telephone, and pipeline companies along with other functions.

ALG plans new facilities

Arkansas Louisiana Gas Co. plans to locate two new operating facilities at Sheridan, in central Arkansas. The $250,000 two-phase expansion involves construction of a gas meter inspection and repair facility and a pipeline maintenance station.

ALG president and chairman W. R. Stephens said the central repair facility will handle all of the over 400,000 meters owned and maintained by the company on its five-state system. The pipeline maintenance station primarily will serve a recently finished 126-mile gas transmission line between Perla station and Helena.

New Englanders plan merge

Connecticut Light & Power Co., Berlin, Conn., plans to acquire the Housatonic Public Service Co., Derby, Conn., through a stock exchange.

Connecticut Light is the largest gas and electric utility in Connecticut, providing electricity in 111 towns and gas in 27. Housatonic supplies gas service in eight towns and electric service in seven.

Heat campaign under way

A two month gas heating sales campaign is in full swing in Public Service Electric & Gas Co.'s New Jersey area. The company is working with manufacturers and distributors of gas heating equipment, plumbing supply houses, plumbers and gas heating installers.

During the two-month drive, Public Service is advertising in daily and weekly newspapers, on billboards, display cards on buses and trucks, and with local radio spot announcements.

Safety honors go to Equitable Gas

Equitable Gas Co., Pittsburgh, has won first place in the National Safety Council's public utility safety sectional contest.

Equitable personnel, with only five lost-time accidents recorded in 1960, set a new company record for safety. Its accident frequency rate was just 1.43 per million actual manhours worked.

Just recently, three Equitable departments climbed over the million-hour mark in safety and six other departments went over the 500,000 manhour record. One group, the compressor stations department, shows 3,024,041 accident-free manhours as of Jan. 31, 1961. This group has had an accident-free record since its organization.

Lone Star boosting system capacity

Lone Star Gas Co.'s new 18-in., 52-mile pipeline in west central Texas will increase capacity of the transmission facilities by more than 100 MMcfd.

In conjunction with the line, Lone Star will increase the size of its gas processing facilities at its Gordon gasoline plant and compressor station. A 2000-hp compressor and a new dehydration unit will be added.

The line starts at Lone Star's Springtown gasoline plant located about 28 miles northwest of Fort Worth. It runs in a southwesterly direction across Parker and Paso Pinto counties to Gordon.

GAS • News Notes

Both branches of West Virginia's state legislature adopted a resolution calling for a study of public utility rate-making by the West Virginia PSC. Rejected was a resolution which would have provided for a study of the relationship between parent out-of-state utilities and their West Virginia subsidiaries.

Two distributors have been named by Koehring Co., Milwaukee. They are: Brown-Fogle Equipment Co., Houston, for southeastern Texas; and Southern Equipment & Tractor Co., New Orleans, Baton Rouge, and Shreveport, covering Louisiana and adjoining counties of Arkansas.

The three barges at work in mid-river

spi COATED AND WRAPPED PIPE CHOSEN FOR RIVER CROSSING

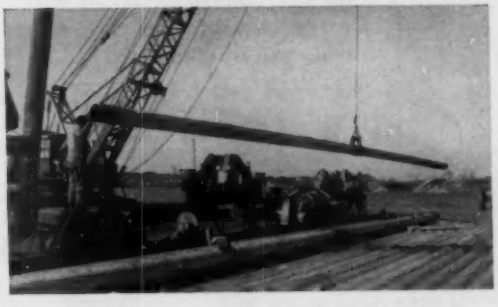
The Mississippi River Transmission Corp. recently laid two 12¾" O.D. pipelines across the Mississippi River just above the Chain of Rocks Bridge at St. Louis. Standard Pipeprotection's coated and wrapped pipe was selected for this important job.

Count on SPI c/w pipe for long lasting pipe protection.

Lowering-in from pneumatic tire cradle

Welding pipe lengths together on the barge

Placing front length of pipe in position on pneumatic tire cradles



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Faultometer underground pipe inspection locates leaks and damaged pipe coating underground.

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A bill authorizing rural electric cooperatives to compete with private utilities in areas annexed by cities was killed by the Texas House of Representatives.

Piedmont Natural Gas Co., Charlotte, N. C., has won a division award in GAMA's Achievement Award contest for the seventh year. The award is for leadership in promotion and sale of commercial gas cooking appliances during AGA's PEP sales campaign.

Florida may double the gross receipts tax on utilities. The increase would provide a $10 million-a-year fund for purchasing highway rights-of-way.

Ground has been broken for Northern Illinois Gas Co.'s new customer service center in Palos Heights. The $100,000 building will provide 11,000 sq ft of space for NI-Gas' customer service operations in southwest Cook county, Ill. Slated for October completion, the center will handle appliance repairs, meter reading, customer calls, etc.

PR winner

The public relations office of Philadelphia Gas Works was named winner of the grand award for PR programs of 1960 by the Pennsylvania Public Relations Society. PGW won the award for its 125th anniversary program commemorating the original authorization by Philadelphia's Common and Select Councils to construct a gas works. Admiring the trophy are (from left): Thomas B. Shriver, president of the society making the award; James Smith, Bell Telephone public relations; and Charles R. DeHaven, manager of public relations for Philadelphia Gas.

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primary element in flow metering, stands on its ability to provide an accurate, reproducible signal. This signal is paramount in differential measurement. Such a signal can be achieved only with orifice plates of quality stainless steels, stretcher-leveled for flatness, precision bored to a knife-edge by expert craftsmen. Your orifice meter deserves to get the best possible signal. We stand on our reputation to provide the best possible orifice plates.

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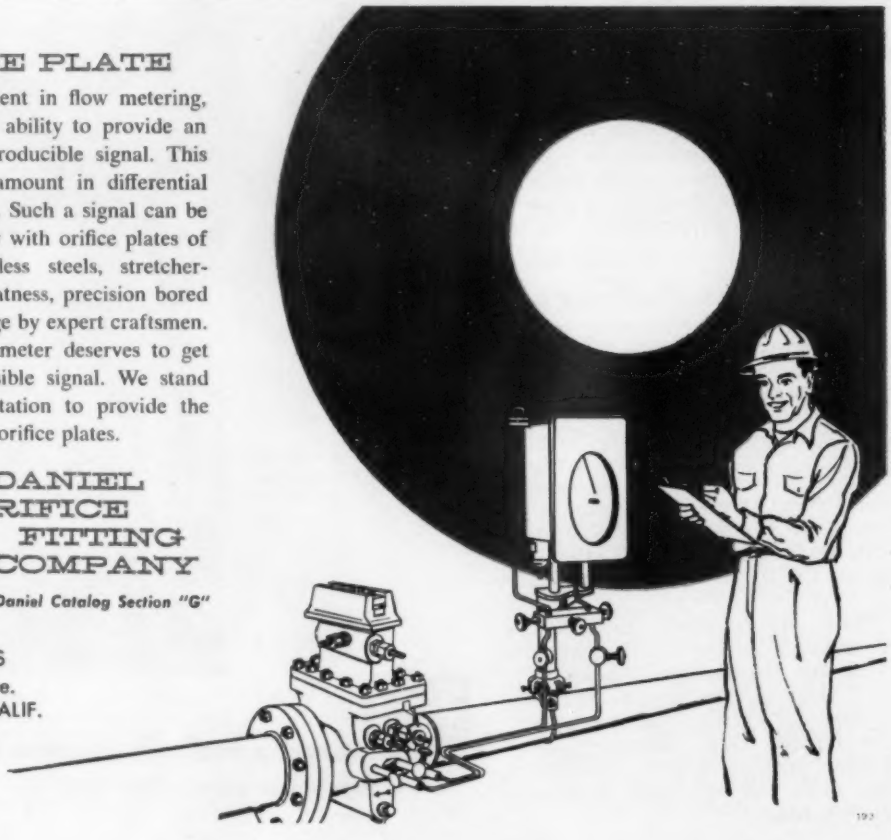


regulatory • *Cont'd.*

from page 12

"(1) accelerate an inventory and evaluation of the nation's public domain holdings to serve as a foundation for improved resource management;

"(2) develop a program of balanced usage destined to reconcile the conflicting uses—grazing, forestry, recreation, wildlife, urban development, and minerals; and

"(3) accelerate the installation of soil-conserving and water-saving works and practices to reduce erosion and improve forage capacity; and to proceed with the revegetation of range-lands on which the forage capacity has been badly depleted or destroyed."

The sea represents one of our most important but least understood and almost wholly undeveloped areas for extending our resources. Continental shelves bordering into the United States contain roughly 20 per cent of our remaining reserves of crude oil and natural gas. The ocean floor contains large and valuable deposits of cobalt, copper, nickel, and manganese. Ocean waters contain a wide variety of dissolved salts and minerals.

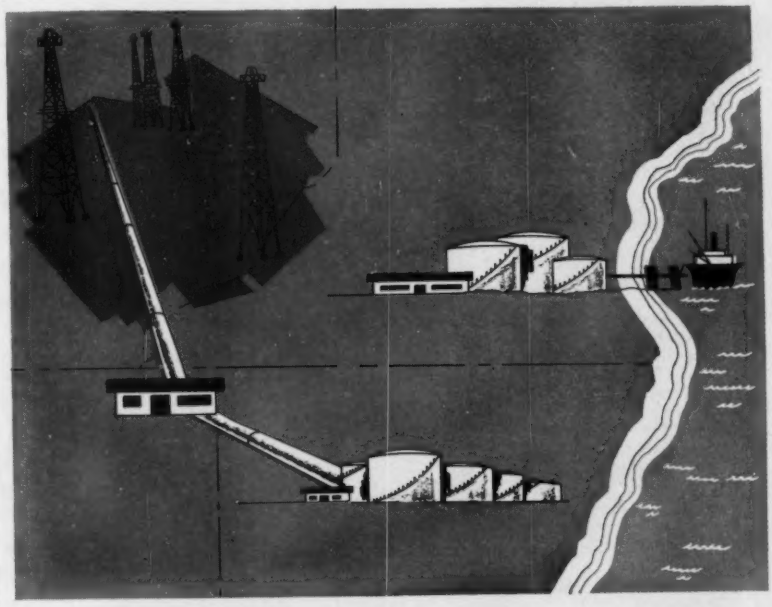
Salt water fisheries are among our most important but far from fully developed reservoirs of protein foods. At present levels of use, this country alone will need an additional 3 billion lb of fish and shellfish annually by 1980. But all this will require increased efforts for rehabilitation of depleted stocks of salmon and sardines in the Pacific, ground fish and oysters in the Atlantic, lake trout and other desirable species in the Great Lakes, and many others through biological research, development of methods for passing fish over dams, and control of pollution.

Mr. Kennedy said: "This administration intends to give concerted attention to our whole national effort in the basic and applied research of oceanography. Construction of ship and shore facilities for ocean research and survey, the development of new instruments for charting the seas and gathering data, and the training of new scientific manpower will require the coordinated efforts of many Federal agencies." ■

communications • *Cont'd.*

from page 145

cent of the total plant investment, and its importance is so great that there is adequate reason to lean in the direction of more and better communication facilities. Unquestionably in time of distress and emergency, with either potential or actual system collapse, the entire cost of the communication system is justified if it performs well and gives continuous, complete, and accurate transmission of intelligence. It is here that the ingenuity of communication engineers comes into play in designing equipment to perform under the most abnormal conditions, including complete system outage. In exploiting microwave, experience indicates that since it is capable of accomplishments not previously possible, communication engineers should be urged to show the courage and vision to plan generously for the future. ■



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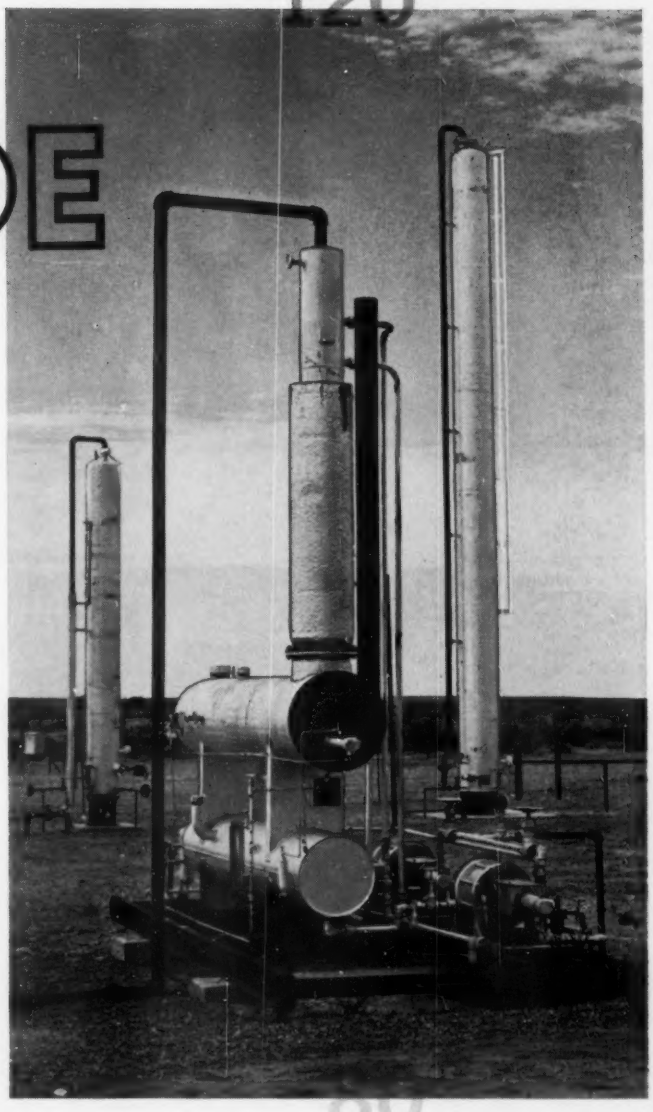

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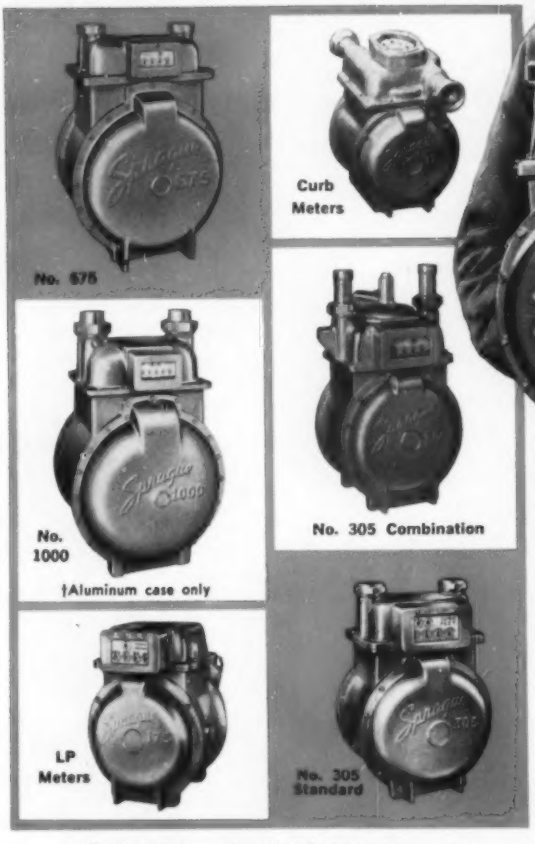

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